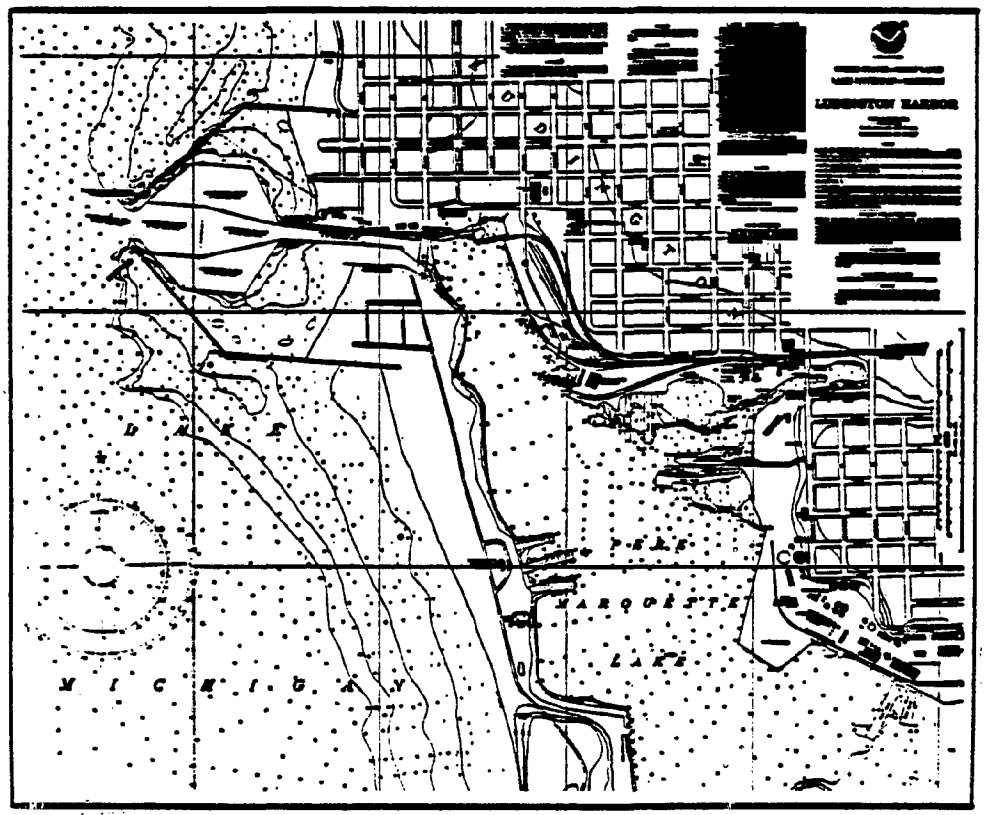
Port Development Study

Prepared for the . . .

Ludington Harbor Commission
The City of Ludington
Pere Marquette Charter Township and Mason County

In cooperation with . . .

MDNR, Coastal Management Program



WILLIAMS & WORKS
GRAND RAPIDS, MICHIGAN
Engineers, Architects, Planners
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CHAPTER I
GENERAL DATA BASE

INTRODUCTION

The Data Base for the Ludington Area Port Development Study is organized into three parts:

A. General Information
B. Economic Conditions
C. Waterborne Commerce

The Data Base is assembled from reliable, published sources, and focuses primarily on transportation facilities and economics. Secondary emphasis is on harbor area land use, especially unused and under-utilized land.

A. GENERAL INFORMATION

1. Regional Location

The City of Ludington is located on the eastern shore of Lake Michigan in Mason County, Michigan. Figure 1 shows the regional location of Ludington. It is approximately 200 miles northeast of Chicago, Illinois; 240 miles northwest of Detroit, Michigan; and 250 miles southwest of Sault Ste. Marie, Michigan. The closest neighboring deep draft harbors are in Manistee (30 miles north) and in Muskegon (60 miles south).

2. Local Setting

Ludington, the largest city in Mason County and the county seat, had a population of 8,937 in 1980. This was approximately 34% of the total 1980 Mason County population of 26,365.

Ludington and its harbor are located on Pere Marquette Lake. Pere Marquette Lake is approximately two miles long and drains the Pere Marquette River. Its outlet to Lake Michigan is protected by the harbor.

Figure 1

REGIONAL LOCATION
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

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MILES

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3. Topography/Hydrography

a. Topography

Picturesque sand dunes occupy much of the Lake Michigan shoreline in Mason County. Elevations vary from approximately 850 in the southern portions of the county to approximately 580 at Lake Michigan. A combination of gently rolling moraines and fairly level, poorly drained lands comprise much of Mason County. In addition to the larger lakes near the shoreline, numerous smaller lakes are located inland.

South of Ludington to a distance of six or seven miles, moraine hills and ridges extend westward to Lake Michigan from approximately six miles inland. North of Ludington, sandy lake bottom lowlands extend inland several miles. The characteristically gentle slopes are interrupted occasionally by abrupt moraine hills.

Topographic characteristics in the immediate vicinity of Ludington Harbor are shown in Figure 2. Directly east of the harbor, the land slopes fairly uniformly toward Pere Marquette Lake. Lowlands and marshes are located at the south end of Pere Marquette Lake and along the lower reaches of the Pere Marquette River.

b. Lake Hydrology

Water levels across Pere Marquette Lake are predominately controlled by Lake Michigan levels and to some extent in the southern reaches by inflow from the Pere Marquette River. The river at its mouth drains a watershed area of 740 square miles covering portions of four Michigan counties. The river's average springtime flow varies from approximately 700 to 900 cubic feet per second, as recorded at the USGS gauging station in Scottville (ten miles upstream from Ludington).

As part of the Great Lakes system, Lake Michigan levels fluctuate in three ways: long-term, seasonal, and short-rise. Long-term fluctuations are caused by the varying response to changing conditions of water input

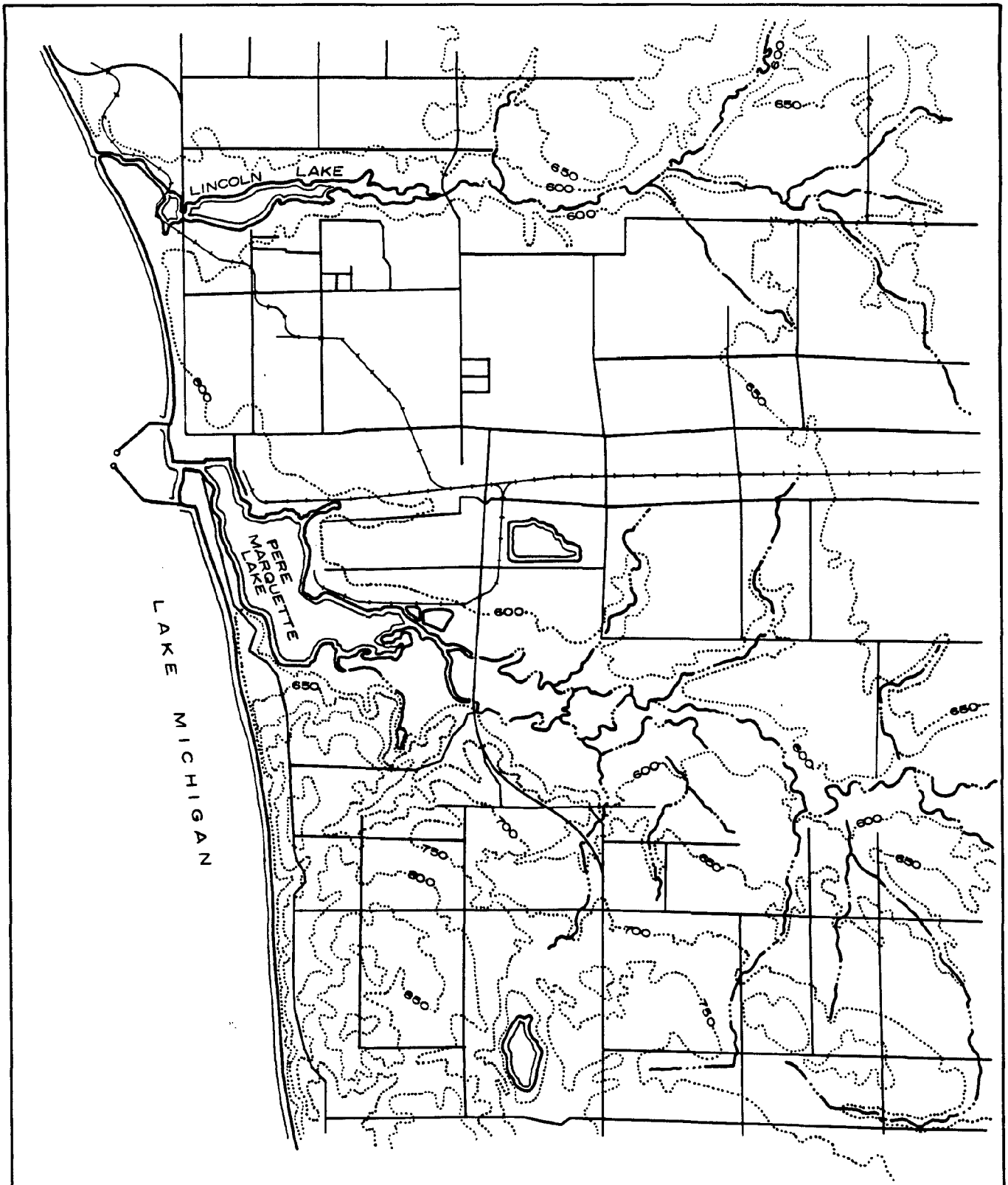

Figure 2
TOPOGRAPHY
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

SOURCE: USGS LUDINGTON QUADRANGLE
15 MINUTE SERIES

CONTOUR INTERVAL = 50 FEET.

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(principally from precipitation within the lake's basin) and to water output due to evaporation and outflow. A net surplus in this water supply balance resulted in the highest recorded monthly mean lake level of 581.1 (International Great Lakes Datum - IGLD) in July, 1974. Seasonal fluctuations produce high levels in summer and low levels in winter. These changes are the direct result of natural seasonal patterns. Spring runoff from snow melt and low evapotranspiration (the loss of water from land areas through plant growth and soil evaporation) produce higher lake levels. In late summer, the opposite is true and lake levels begin to fall. Short-rise fluctuations of lake levels are caused by differences in atmospheric pressure and winds blowing over the lake surfaces. The result of these forces is a rise of the water surface in one area of the lake with a concurrent drop in level in another area.

Generally, Lake Michigan levels have an average seasonal variation of about 1.2 feet, from 577.7 in February to 578.9 in July. Over the past two years, the lake levels have been approximately one foot above long-term average levels and are gradually declining.

c. Currents

There are no known studies or documentation of significant currents in Pere Marquette Lake or the harbor area. The most likely producer of currents is the Pere Marquette River, which causes a net flow of water through Pere Marquette Lake to Lake Michigan. However, the features of Pere Marquette Lake are not supportive of strong currents.

Occasionally, wind drift currents may be generated within Pere Marquette Lake and storms over Lake Michigan will produce currents of short duration.

d. Erosion and Sedimentation Patterns

The Lake Michigan shoreline in the vicinity of Ludington is erosional. Steep slopes without significant beach zones typify the shoreline several miles to the south of Ludington and indicate encroachment and land removal. Lowlands surrounding the lakes north of Ludington are less obviously

marked by erosion because of their original low elevation and low relief. Longshore transport of sand occurs in the zone of swash and backwash where waves interact with the shore most energetically. The dominant direction of transport of sand along the Lake Michigan shoreline near Ludington is southward, as determined by the U.S. Army Corps of Engineers.

Identification of high-risk shore erosion sites was made in 1970 under the supervision of the Michigan DNR under contract with a private organization. The method used was one of comparing aerial photographs of 1970 with those of 1938. Follow-up by the Bureau of Water Management was undertaken in 1971 and 1972 with field studies to determine more recent trends. Results of the study in the Ludington area indicated a general pattern of considerable erosion with some sedimentation occurring in isolated areas.

Michigan's Demonstration Erosion Control Program has three projects in the vicinity of Ludington for the purpose of monitoring and evaluating low cost shore protection measures. These projects are a seawall at Big Sable Point (seven miles north of Ludington), two steel groins at Ludington State Park (just south of Big Sable Point), and a pre-cast concrete breakwater system in Pere Marquette Township (one mile south of the harbor entrance). Only the steel groins at Ludington State Park have remained stable and provide protection against erosion.

As mentioned previously, Lake Michigan levels are gradually declining at present. Reduced lake levels tend to result in reduced erosion since adjacent lands are less likely to be inundated or subject to wave attack.

e. Harbor Maintenance Depths

Project depths are maintained at 29 feet at the harbor mouth, 27 to 29 feet within the breakwaters, and 27 feet through the entrance channel. The average depths along the northern central portion of Pere Marquette Lake vary from 33 to 43 feet. Southern portions of the lake become increasingly shallow and swampy. Most recreational anchorage is at 5 to 15 feet, while commercial docking facilities maintain depths of 20 to 25 feet. Figure 16, "Harbor Structures", also shows the authorized harbor depths.

f. Flood Hazard Areas

Lake Michigan flood levels have been determined by the U.S. Army Corps of Engineers in a 1977 study. The 10-year and 100-year flood levels at Ludington are 581.3 and 582.5 (IGLD), respectively.

The City of Ludington, built almost entirely on land with an elevation of 600 or above, has no special flood hazard areas, as identified by the National Flood Insurance Program, and does not have a history of significant flooding.

4. Geology/Soils

a. Geology

The City of Ludington lies on the east/west axis of Lake Michigan proper, midway between the north and south ends of the lake. The recent geological history of the Ludington area has involved events common to other regions on the west shore of Lake Michigan. The Pere Marquette River Valley and its evolution are convenient points of focus for descriptions relevant to the Ludington Harbor area.

The Ice Ages, especially the latest one which terminated 9,500 years ago in Michigan, and post-glacial times until 2,000 to 3,000 years ago were the times of establishment of the present day prominent features of the area, especially topography, land forms, and the extent of surface water.

Following the final disappearance of ice from the Lake Michigan shore region, the Pere Marquette River was larger and swifter and flowed in a narrower valley than exists today. Neither Pere Marquette Lake nor the Buttersville bar, which separates Pere Marquette Lake from Lake Michigan, existed. The Pere Marquette Lake site could have been a narrow embayment at that time.

A period of rising Lake Michigan water level culminated approximately 4,000 years ago. That period saw flooding of the Pere Marquette River

Valley floor and channel. A long and narrow embayment may have extended eastward to Scottville and even further inland during this period. Lake Michigan covered the site of the City of Ludington.

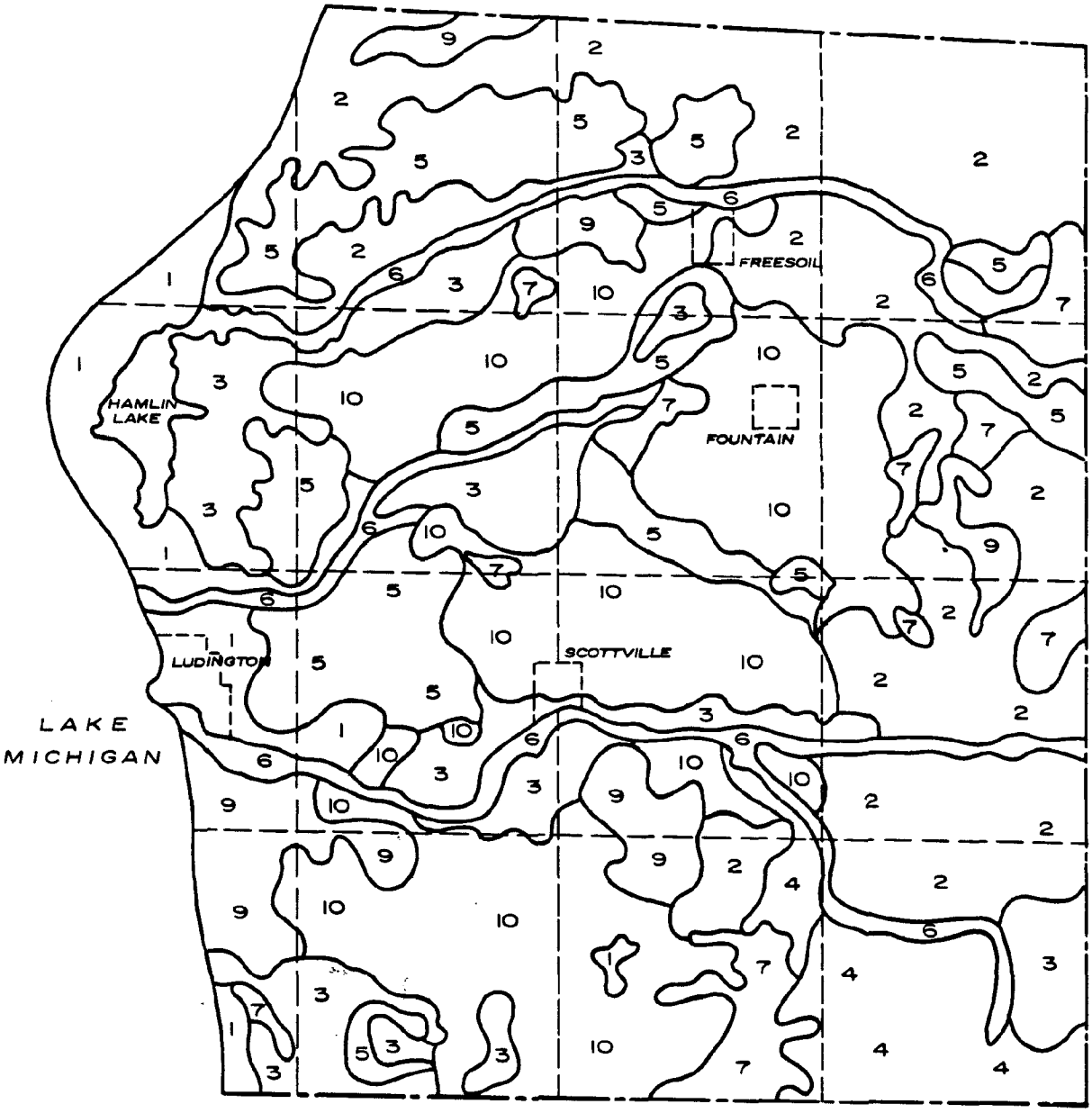
Falling Lake Michigan levels followed and levels were generally stabilized by 2,500 years ago. During that interval (4,000 to 2,500 years ago), Ludington was uncovered as the Lake Michigan shoreline receded. The Buttersville bar was uncovered to form Pere Marquette Lake.

These glacial actions have resulted in the Ludington area being underlain by glacial drift material up to several hundred feet deep with no outcroppings of bedrock. The morainal areas south of Ludington are hilly with bold detached ridges. Outwash areas to the north and east are relatively flat, undulating plains, except where cut by stream channels.

b. Soils

A detailed soil survey has been conducted in Mason County by the U.S. Department of Agriculture in 1939. The soils were found to range from dry sands of the lake dunes to dark-colored, poorly drained silt loams, mucks, and peats. Over the greater part of the county, the association of areas of soils with different textures and colors is complex and the areas are of irregular shapes. Sands and loamy sands predominate in total area, occupying about 58% of the land surface of the county; organic soils occupy about 9%; and the remaining 33% is divided among sandy loams, loams, and silt loams, which are the important agricultural soils.

Soils in the Ludington area are shown on Figure 3, "Soils Interpretations". The Lake Michigan shoreline in the immediate area of the harbor is composed of dune and coastal beach sands. Areas along the north shore of Pere Marquette Lake have been filled with sand and other material to form building sites and are thus classified as manmade land. Rubicon sand underlies most of the City of Ludington with Weare fine sand in the surrounding area.



1 DUNE SANDS
2 RUBICON - GRAYLING
3 KALKASKA - RUBICON
4 RUBICON - GRAYCALM
5 ROSCOMMON - AUGRES - CROSWELL
6 ALLUVIAL SOILS
7 CARLISLE - CARBONDALE - RIFLE
8 NESTER - KAWKAWLIN - SIMS
9 MONTCALM - MCBRIDE - KALKASKA
10 KENT - SELKIRK - BERGLAND

SOURCE: USDA SOIL CONSERVATION SERVICE

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Figure 3
SOILS INTERPRETATIONS
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

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In the harbor area, soil borings were taken in connection with the harbor and channel modification project in 1966, and off-shore north of the harbor in conjunction with the Ludington water intake project in 1967. These data reveal that soils in the inner harbor turning area are dominantly fine sands of very loose to dense consistency. Sand with gravel admixtures is subordinant in amount, and no clay is present. Soils in the inner channel area are composed primarily of fine to coarse sands with subordinate admixed gravel. The degree of density is mostly medium to dense. Hard, sandy clay appears at depths of 17 feet below the bottom in the north side of the channel. Soils from off-shore locations north of the harbor consist in the upper levels of medium to fine sand. The sand is underlain with blue, sandy clay.

c. Groundwater

Because of the glacial history of the Ludington area, the hydrological conditions of the area are not uniform. This non-uniformity is due to the thick bands of glacial drift interwoven with deposits of clay. The actual drift material varies from sand to silty sand to silt. Water is normally found lying between the clay deposits in the glacial drift. Because of the non-uniformity of the drift, groundwater in the Ludington area is unpredictable, and supply capabilities within short distances may vary from as much as 50 to 1,000 gallons per minute.

5. Climate/Weather Conditions

a. Climate

The Lake Michigan region is moderate in temperature and precipitation, due to westerly winds across Lake Michigan. Average temperatures on a year-round basis are close to 50°F. Average temperatures in the Ludington area are close to 47°F. The winters are long; the summers are short and warm. The difference between the average summer and winter temperatures is approximately 40°. Rainfall averages just under 30 inches per year, with about 20 inches occurring from April to October. Snowfall is a bit higher than inland areas, with about 70 inches per year.

b. Winds and Wave Heights

The Great Lakes Region lies in a path of frequent high and low atmospheric pressure cells which move west to east across the North American continent at more or less regular intervals of about three to five days. Wind storms over Lake Michigan are normally caused by frontal passage of low pressure centers along with the movement of extensive areas of high pressure. The more severe wind storms normally occur where these features meet. The general direction of low and high pressure movements across Lake Michigan is southwest to northeast.

The more sustained and vigorous wind storms generally occur during the winter-spring seasons when the air mass contrasts are the greatest and pressure fields most intense. The summer months are the calmest periods of the year, although short duration storms such as those associated with squall lines or thunderstorms do occur.

The minimum wind speed theoretically effective in promoting fully developed sea conditions on Lake Michigan is 40 mph or less. Maximum recorded wave heights in the Ludington Harbor prior to construction of navigational improvements in 1977 were 10.0 feet inside the harbor entrance, 6.2 feet at the entrance to the inner channel, 5.0 feet at the inner channel turn into Pere Marquette Lake, and 1-3 feet along the northern reaches of the lake. Construction of the harbor improvements have not significantly affected wave heights.

c. Ice Conditions

Winter conditions usually produce only minor ice problems for commercial navigation interests. The harbor between the breakwater entrance and the inner channel piers is usually free of ice, but westerly winds occasionally cause ice to drift into the outer harbor and then between the inner channel piers. Car ferries and commercial vessels break through the ice masses, pushing them aside. With time, the ice piled laterally along the channel margins becomes too heavy to push aside.

The City boat launching facility, midway between the north breakwater and the north pier, is frequently in need of repair due to erosion. Some of the damage to the facility may be attributed to ice jamming.

6. Zoning

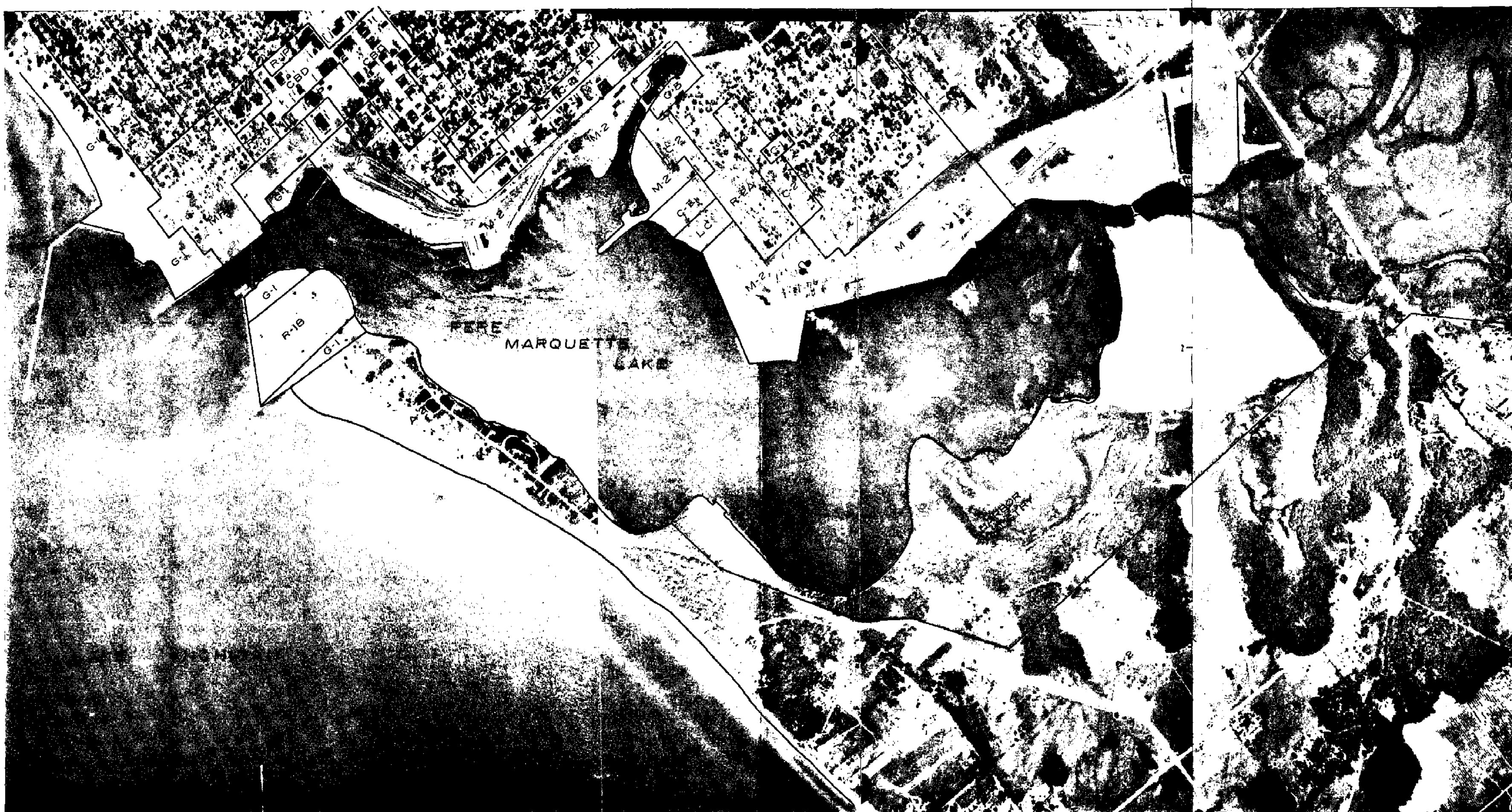
Figure 4 shows the existing zoning districts in the harbor and Pere Marquette Lake area. The City of Ludington's zoning ordinance has been in effect since 1966. This zoning ordinance provides for five classes of residential zoning, four classes of commercial zoning, two classes of industrial zoning, and four classes of special zoning (parking, river valley, motel resort and government service).

Pere Marquette Township adopted its current zoning ordinance in 1977. The ordinance provides for two classes of agricultural zoning, two classes of residential zoning, one class of commercial zoning, one class of industrial zoning, and three classes of special zoning (airport, conservation, and harbor industry).

Generally, lands adjacent to the harbor are zoned commercial and industrial districts, while outlying areas are zoned residential districts. An exception is the Buttersville Bar which separates Pere Marquette Lake from Lake Michigan, and which is a zoned residential district.

7. Existing Land Use

The pattern of existing land use, shown in Figure 5, fits well with zoning of the area. There is very little room for industrial expansion along the northeast shore of Pere Marquette Lake. Conversely, the southwest shore (Buttersville Bar) consists of fairly low density residential development. The lowlands at the southernmost shores of Pere Marquette Lake in Pere Marquette Township are zoned the "Harbor Industry District" to provide areas for loading, unloading, shipping, receiving and storage of materials as a water port facility. Currently, these areas are undeveloped.



LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN

EXISTING ZONING

MARCH, 1982

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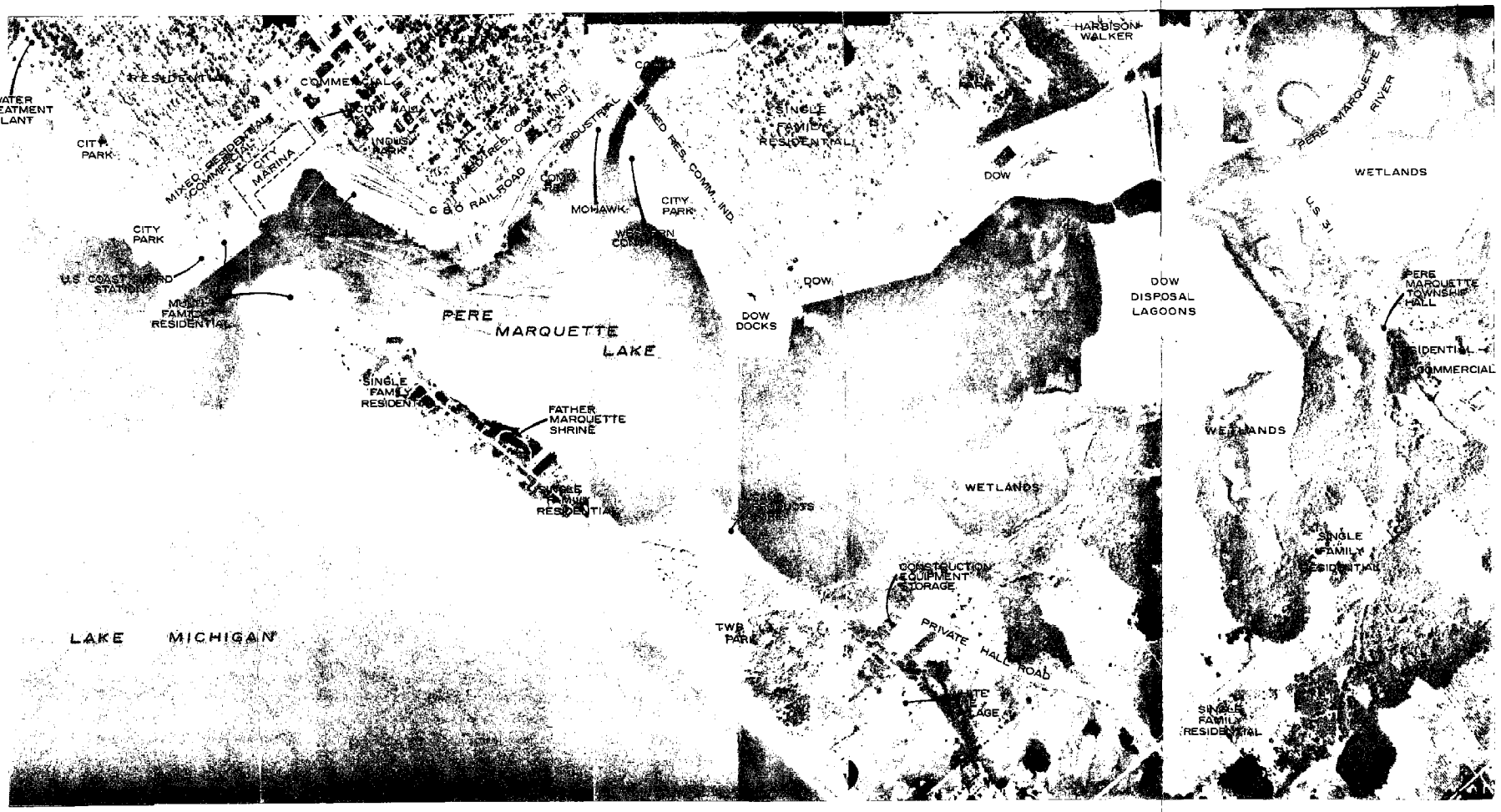

LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN
Figure 5

GENERALIZED LAND USE

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8. Utilities and Infrastructure

Properties within the City of Ludington enjoy the availability of utilities including water, sewer, electricity, gas, and telephone service. Michigan Consolidated Gas Company and Consumers Power Company are the largest suppliers of natural gas and electricity, respectively, in the Ludington area. Water and sewer services are provided by the Ludington water plant and wastewater treatment plant. With few exceptions, areas outside the city limits have only electricity and telephone service readily available.

9. Demographics

a. Historic Profile

The permanent population of an area supports the primary labor force and requires goods and services on a year-round basis. The population of Mason County has been increasing steadily since 1930, and has seen an increase of 16.6% over the past ten years. The population of the City of Ludington, meanwhile, has fluctuated between a low of 8,810 in 1920 to a high of 9,506 in 1950. Over the past ten years, Ludington's population has decreased 0.9%. Table 1 shows the population of Ludington and Mason County from 1890 to the present.

TABLE 1
POPULATION
MASON COUNTY AND LUDINGTON

	Mason County	Ludington
1890	16,385	-
1900	18,885	-
1910	21,832	9,132
1920	19,831	8,810
1930	18,756	8,898
1940	19,378	-
1950	20,474	9,506
1960	21,929	9,421
1970	22,612	9,021
1980	26,365	8,937

Source: U.S. Census of Population

Ludington has an average density of 2,700 people per square mile and 2.3 people per dwelling unit.

Age, years of schooling, and family income for Mason County are shown in Table 2, "Population Characteristics". This information is not yet available for the 1980 census. Table 3 shows the age distribution for the City of Ludington in 1970.

TABLE 2
POPULATION CHARACTERISTICS
MASON COUNTY

Age by Percent of Total Population	1960	1970
Under 15 years	31.3	28.5
15 to 24 years	12.1	14.8
25 to 39 years	16.6	15.3
40 to 65 years	27.3	28.3
65 + years	12.7	13.1
Years of School Completed by Persons Over 25 Years by Percent of Total Persons		
8 or under	42.7	27.4
1 to 3 high school	17.0	20.1
4 high school	27.9	36.0
1 to 3 college	7.5	9.5
4 college	4.9	7.0
Median years completed	10.3	12.1
Family Income by Percent of Total Families		
Less than $3,000	25.2	10.9
$3,000 to $5,000	25.0	10.6
$5,000 to $7,000	27.4	14.5
$7,000 to $10,000	14.9	26.4
$10,000 to $15,000	6.0	25.7
$15,000 +	1.5	11.9
Median income	$6,270	$8,476

Source: U.S. Census of Population

TABLE 3
AGE DISTRIBUTION
LUDINGTON, 1970

0 to 4 years	661
5 to 14 years	1,715
15 to 24 years	1,348
25 to 44 years	1,854
45 to 64 years	2,068
65 + years	1,375

Source: U.S. Census of Population

b. Population Projections

Population projections through the year 1997 are given in Table 4 for Ludington and Mason County. These trends predict an average yearly increase of approximately 1% for Mason County and 0.9% for the City of Ludington.

TABLE 4
POPULATION PROJECTIONS
MASON COUNTY AND LUDINGTON

	Mason County	Ludington
1982	27,050	10,850
1987	28,440	11,350
1992	29,800	11,850
1997	31,230	12,350

Source: 208 Study for Mason County

10. Transportation

a. Roads and Regional Highways

The Ludington area is served by US-31 (north-south) and US-10 (east-west). M-116 connects Ludington to Hamlin Lake and the Ludington State Park, five miles north. US-31 is an arterial of statewide importance. The Michigan

portion begins at the Indiana border and continues through to the Mackinac Bridge. In the process, it provides access to every major community along the eastern shore of Lake Michigan. At present, US-31 is 4-lanes from Muskegon (where it connects with I-96) to a few miles south of Ludington. Transportation plans call for US-31 to be 4-lanes to Ludington in the future.

b. Waterborne Transportation

The Ludington Harbor is a natural deep-draft, year-round harbor serving both commercial and recreational needs. Waterborne commerce has averaged about 3,000,000 tons annually over the past ten years. Roughly two thirds of this is car ferry traffic to and from the Chesapeake & Ohio Railroad docks. Most of the balance of commerce consists of limestone receipts by The Dow Chemical Company, moved in self-unloading bulk carriers.

Detailed information on commodity flows and types is discussed in Part C, "Waterborne Commerce", page I-24.

c. Railroads

Ludington is served by the Chesapeake & Ohio Railroad, with through trains daily to the principal cities of Saginaw, Bay City, Port Huron, and Detroit.

The railroad also operates a car ferry which transports train cargo across Lake Michigan to the Wisconsin port of Kewaunee. Figure 6 shows the railroad locations in the Ludington area.

Numerous railroad spurs extend to the northeast shores of Pere Marquette Lake, primarily to the Chesapeake & Ohio Railroad's car ferry docks and to The Dow Chemical Company. Main tracks are also located in close proximity to other commercial docks on the northeast shores of Pere Marquette Lake. Additional spurs could be constructed in these locations if necessary.

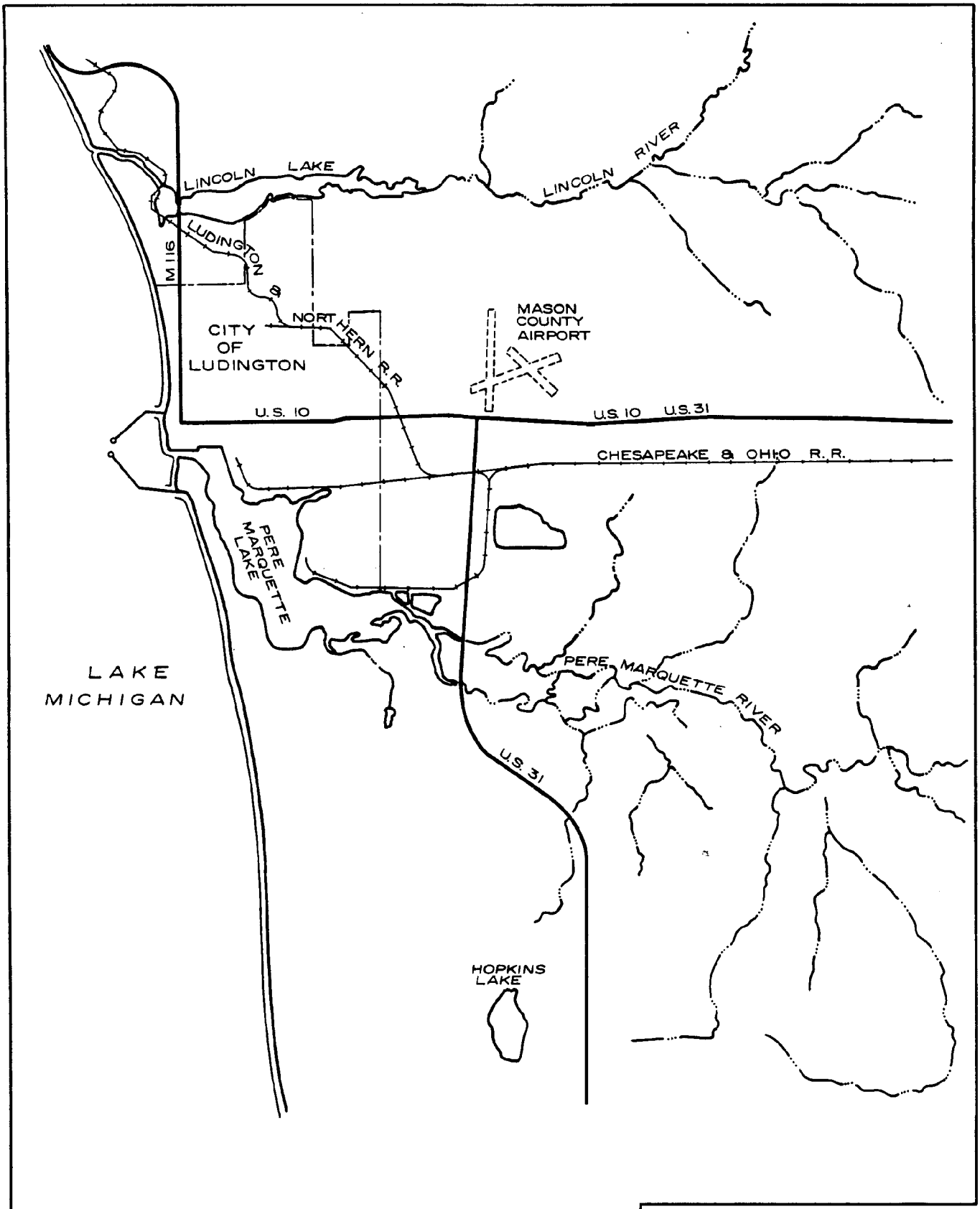

Figure 6
TRANSPORTATION FACILITIES
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

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d. Air Transportation

Mason County has a general utility airport located 1.7 miles east of the City of Ludington. The present northeast/southwest main runway is 5,000 feet by 75 feet and is paved. Plans have been made to increase its length to 5,400 feet. Figure 6 shows the location of the Mason County Airport.

The nearest airport with commercial service is Manistee County Blacker Airport, 25 miles northeast of Ludington.

11. Cultural/Historic Elements

The earliest history of Mason County was recorded in the 17th and 18th centuries by the French, who explored the Lake Michigan shoreline and blazed trails through the forest of western Michigan, seeking fur pelts for trade. An explorer of this period was Pere Jacques Marquette, a French Jesuit missionary. The Pere Marquette Shrine, located near the mouth of the Pere Marquette River, marks the location of his death in 1675. The shrine is on the State Register of Historic Places.

White Pine Village, located in Pere Marquette Township on the shore of Lake Michigan just south of the Buttersville Bar, is operated by Mason County. The village consists of original and reconstructed buildings and a museum.

Because of its many outstanding natural values, the Pere Marquette River has been included under the State of Michigan Natural River Act of 1970 (PA 231 of 1970) and the National Wild and Scenic Rivers Act (PL 90-542). This designation serves to protect the natural qualities of the river's mainstream and its significant tributaries upstream of US-31.

12. Recreation/Tourism

The climate and location of Ludington provide a year-round multitude of recreational activities. The Ludington Municipal Marina, completed in 1981, has 150 berths to provide for recreational boating on a large scale. 4,156 acres of natural wooded and dune areas are located five miles north at the Ludington State Park.

Recreational fishing is very popular in the Ludington area. Between April 1 and mid-November, both the north and south breakwaters are used extensively by fishermen and sightseers. Coho and chinook salmon enter Pere Marquette Lake from Lake Michigan. Panfish, walleye, and northern pike also populate both lakes. Since 1972, Ludington has sponsored an annual coho fishing derby, an event which spans two weeks and is well received.

The high quality of sport fishing in the Ludington area is a strong attraction for both tourists and seasonal residents. A substantial portion of the area's economy can be directly or indirectly related to the sport fishing activities.

Winter sports are also very popular, and local activities include winter festivals, cross country skiing, and dog-sled and snowmobile races.

Because of the recreational and historic elements of the Ludington area, tourism brings a significant increase in activity and business volume in the area. The peak tourist season is between Memorial Day and Labor Day.

B. ECONOMIC CONDITIONS

1. Regional and Local Markets

a. Overview

Michigan has three major assets for economic development. Its central location on the Great Lakes and in the Midwest provides transportation and trade advantages. Its diverse natural resources include iron ore, petroleum, natural gas, fertile soil, abundant water, and forests. Most importantly, its heterogenous population with comparatively high level of education and trade skills provide the labor supply and managerial ability for the state's variety of industries.

b. Market Areas

Major metropolitan areas provide the largest markets for consumption of goods, distribution points for shipment to smaller markets, and the production points for goods for shipment to other areas. As Figure 7 indicates, Michigan and the Ludington area are near the center of the distribution network of major midwest metropolitan areas. Large cities such as Cleveland, Pittsburgh, Cincinnati, Indianapolis, and St. Louis are within

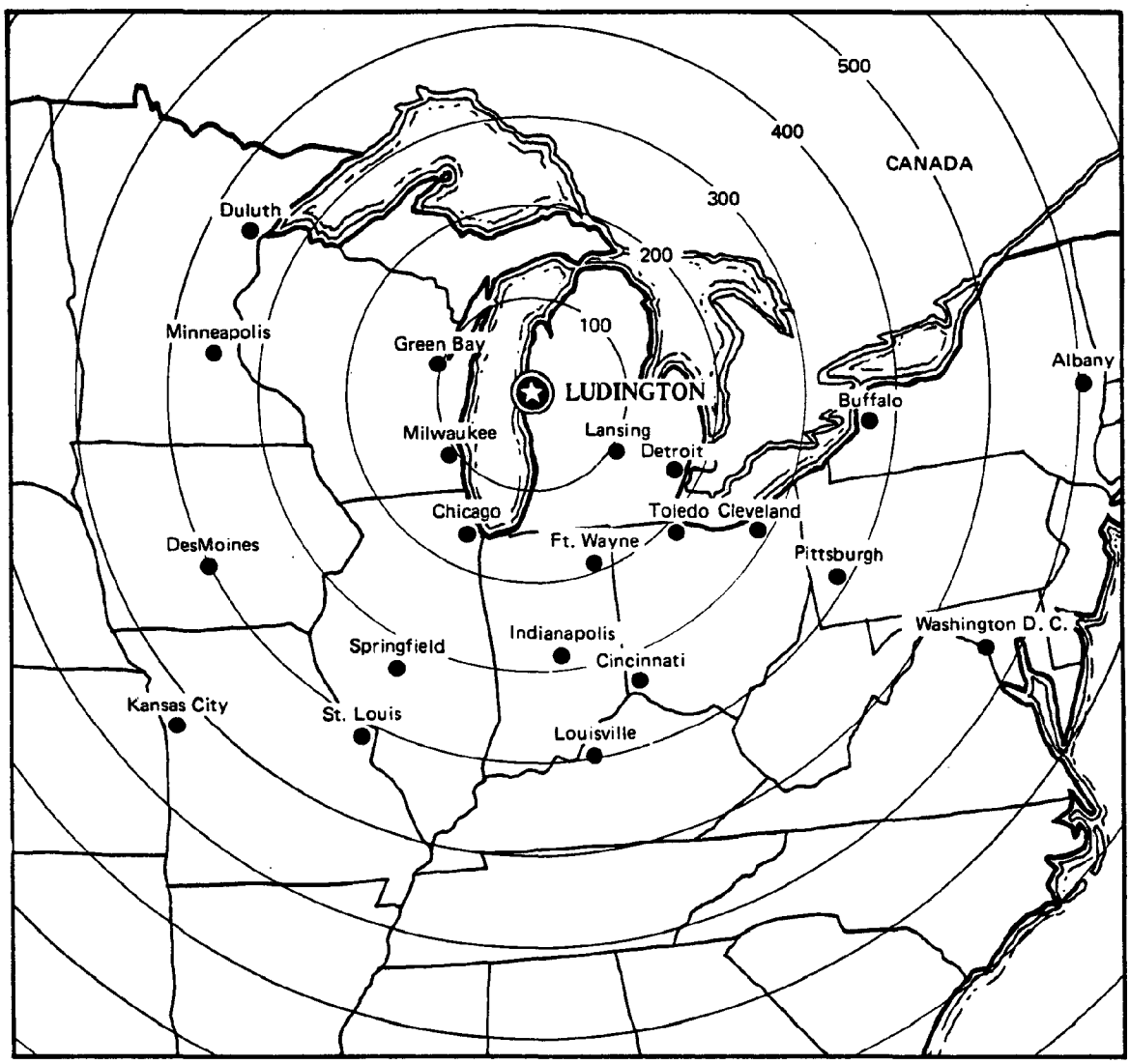


Figure 7
DISTANCES TO
REGIONAL MARKET AREAS
(MILES)

CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

a day's drive of north central Michigan, and are easily accessible by truck and rail transportation. Basic raw materials such as iron ore, coal, petroleum and limestone are economically moved on the Great Lakes to major industrial centers such as Chicago, Toledo, Detroit and Buffalo.

Since the opening of the St. Lawrence Seaway in 1959, the region has direct waterborne access to all foreign ports and markets of the world, although the seaway has some functional limitations due to the draft requirements of modern ocean-going vessels.

c. Specific Market Sectors

The major market sectors presented herein roughly equate with the major classes of port traffic.

(1) Agriculture - Grains and Fertilizers

The midwest is, by far, the major producer of U.S. grain, with Illinois, Iowa, Indiana, Nebraska, and Kansas the leading states. Minnesota and North Dakota are also large producers, selling over 10 million short tons each in 1976. While much of this grain is shipped overseas, a large portion is moved to markets in the eastern seaboard and sunbelt states. Table 5 shows the production of major crops for midwestern states in 1974.

Dairying, with corn, grain, and hay as crops, is the dominant farming type in Michigan. It is most developed in the interior parts of the southern lower peninsula, but is found throughout the state. Fruit - particularly cherries, peaches, apples, plums and blueberries - is grown just inland from Lake Michigan from Berrien County to Grand Traverse Bay.

Michigan is a major supplier of dry edible beans for the U.S., grown on the fertile, flat lake-bottom soils of the Saginaw Valley. Michigan also exports beets. Most other agricultural products are imported to Michigan, including soybeans, wheat, corn, and potatoes.

Table 6 shows cash receipts from Michigan's farm markets.

TABLE 5
1974 PRODUCTION OF SELECTED CROPS IN THE MIDWEST
(by state)

State	Corn (acres)	Soybeans (bushels)	Wheat (bushels)	Irish Potatoes (hundred weight)	Sweet Potatoes (bushels)	Hay Crops (dry tons)
Illinois	9,950,090	205,382,348	50,646,729	289,310	10,364	2,821,607
Indiana	5,311,243	94,724,611	44,246,255	1,481,941	7,964	1,831,874
Iowa	12,706,571	190,916,604	1,794,494	453,734	4,570	5,896,261
Kansas	1,975,682	18,634,381	299,416,699	93,847	33,621	4,032,977
Michigan	2,378,301	12,080,412	81,891,280	8,500,560	63,474	2,956,963
Minnesota	6,050,574	73,735,439	74,728,537	17,190,968	3,432	6,512,436
Missouri	2,817,492	87,981,623	34,764,459	96,966	51,377	5,080,402
Nebraska	6,436,708	25,528,000	90,599,286	2,347,664	561	5,805,323
North Dakota	495,926	2,509,507	209,162,432	20,932,659	85	4,567,783
Ohio	3,421,942	81,392,887	56,715,928	3,078,651	4,003	2,744,427
South Dakota	3,634,336	6,876,227	55,621,567	375,341	0	5,284,209
Wisconsin	3,451,232	3,813,422	2,871,897	13,778,777	4,680	10,168,458

Source: Regional Environmental Energy Data Book, 1978

TABLE 6
MICHIGAN CASH RECEIPTS FROM FARM MARKETS
(in thousands of dollars)

Item	1974	1976	1978
Livestock and products	$ 687,857	$ 812,249	$ 997,659
Field crops	963,932	908,828	1,129,132
TOTAL	$1,651,789	$1,721,077	$2,126,791

Source: Michigan Statistical Abstract, 1980.

In 1969, almost 600,000 tons of commercial fertilizers were used in Michigan at a cost of over $53 million. These fertilizers were applied on roughly 40% of the state's 8.5 million acres of cropland, and averaged more than 400 pounds per acre. The amounts applied per acre were highest in the Upper Peninsula and northwest part of the Lower Peninsula to offset poor soils. In 1978 in Mason County, commercial fertilizers were applied to 40% of the farmland (35,300 acres), herbicides were applied on 28% (24,800 acres), and pesticides on 15% (12,900 acres). The current trend in agriculture of a sharp increase in yields, yet less overall land in farms, is causing an increasing demand for commercial fertilizers.

(2) Manufacturing - General Cargo and Bulk Chemicals

The Great Lakes Region is characteristic of a broadly diversified manufacturing base, but one dominated numerically by heavy industry. These tend to be relatively well paying industries, but are very susceptible to adverse trends in the national economy.

Transport equipment, primarily automobiles and trucks, produce more than half of the value of Michigan manufactured products. The next most important manufacturing category is the production of machinery, including electric machinery, which accounts for about one-fifth of the goods produced in Michigan. The third category in importance, primary and fabricated metal industries, is closely related to the first two and is often found in association with the automotive industry.

Production of chemicals and allied products, located in salt- and brine-producing areas such as Midland-Saginaw-Bay City, Muskegon, and around Detroit, accounts for about 5 percent of the manufactured goods in Michigan. Manistee and Mason counties are also major producers of brine in Michigan. Three other categories account for about 1.5 to 2 percent each of the value of products by industry groups; namely, food and kindred products, apparel and related products, and lumber and wood products. The locations of these industries are widespread but have some relation to the distribution of the raw material sources or market areas. Some industries are concentrated in one regional center, such as furniture in Grand Rapids, paper in Kalamazoo, breakfast cereals in Battle Creek, and baby food in Fremont.

(3) Construction - Sand, Stone and Cement

The Midwest is a major producer and consumer of construction materials, including stone and clay products, sand, gravel and cement. Table 7 shows the value of these products sold in 1975 in the Midwest states.

TABLE 7
VALUE ADDED* BY MANUFACTURE FOR STONE, CLAY AND GLASS PRODUCTS
1975 (MIDWEST STATES)

State	Value Added (millions of dollars)
Illinois	910.5
Indiana	563.7
Iowa	203.3
Kansas	231.6
Michigan	551.9
Minnesota	232.7
Missouri	302.5
Nebraska	85.1
North Dakota	11.9
Ohio	1,439.4
South Dakota	23.4
Wisconsin	214.0

---

*The value of goods sold, less cost of necessary materials and power, expressed in 1958 dollars to account for inflation.

Construction in Mason County displayed very substantial increases, both net and competitive, during the 1970's, compared to both the state and the region. Much of the gains in construction can be attributed to the building of summer homes and retirement homes and could fluctuate substantially during downturns in the business cycle.

(4) Energy - Coal and Petroleum Fuels

There has been increased activity in petroleum industries in Michigan in recent months. A number of petroleum companies are purchasing mineral rights from area residents, and natural gas and oil have been found southeast of Mason County in Newaygo County near Hesperia. Continued price increases in petroleum products are forecasted for the future (despite recent short-term declines) and are expected to further stimulate local energy production.

2. Employment and Salaries

a. Regional Employment

On a Great Lakes regional basis, employment is predominantly in the agricultural and heavy industry areas. While Michigan ranks first among the states in production of motor vehicles and parts, employment is also predominant in other manufacturing and processing lines, including prepared cereals, machine tools, airplane parts, refrigerators, hardware, steel springs, and furniture.

b. Local Employment

Local employment in the western half of Michigan and the Ludington area has become substantially more stable in the past ten years in terms of employment, when compared to the rest of the state. This indicates a somewhat stronger and more stable economy than that seen state-wide.

3. Industry

Ludington has a solid and diversified industrial base. It is the dominant industrial center in Mason County and the area.

The Ludington area supports a variety of industries and employers, including:

Company	Main Business/Product
Atkinson Manufacturing Company 502 S. James Street	Tool & Security Boxes, Closet Accessories
Anna Bach Candies, Inc. 413 S. James Street	Candies
Brill Manufacturing Company 713 S. James Street	Pine Furniture
Chadwick Memorials, Inc. 401 W. Ludington Avenue	Cemetery Memorials, Building Stone, Structural Marble, Concrete Urns, Patio Slabs
CDR Industrial, Inc. 236-1/2 Dowland Street	Screen Printing - Metal Fiberglass
Custom Foam of Castle Industries 1001 N. Rowe Street	Styrofoam
Dow Chemical U.S.A. S. Madison Street	Chemical Manufacturing, Liquid Calcite
Foliage Company of America N. Rowe Street	Fabrications
Great Lakes Casting Corporation 800 N. Washington Avenue	Gray Iron Castings
Harbison-Walker Refractories Company US-31	Deadburned Magnesite
Handy Things Manufacturing Company 814 N. Rowe Street	Christmas Tree Holders and Housewares
Harrington Tool Company 200 W. Ludington Avenue	Special Metal Cutting Tools
Industrial Tool Engineering 1176-1/2 N. Jebavy Drive	Machine Products
Jackson Vibrators, Inc. 200 S. Jackson Road	Railroad Maintenance & Industrial Handling Equipment

Company	Main Business/Product
Kaines Manufacturing Company 130 F. Dowland Street	Wire Products
Ludington Concrete Products, Inc. 280 S. Pere Marquette Street	Redi-Mix, Concrete & Light Weight Block, Face Brick
Ludington Plastics, Inc. S. Jebavy Drive	Plastics
Ludington Industrial & Mfg Co. 901 N. Harrison Street	Electro Plating
Mason County Cold Storage, Inc. Route #1	Fresh Fruits
Merdel Game Mfg Co. 218 F. Dowland Street	Wood Action Games
Mitchell Corporation 185 S. Jebavy Drive	Automotive Interior
Motyka Metal Products E. Ludington Avenue	Tubing
Nelson Packing Company 5251 E. First Street	Meat Packing Plant
Olmstead Orchards Route #1	Wholesale Fruit Packing & Storage
Petersen's Furniture Specialties 922 N. Washington Avenue	Custom Furniture
Outstate Tool & Die, Inc. 526 S. James Street	Progressive Dies, Tooling, Stampings, & Die Tryouts
Savage Manufacturing Company, Inc. 211 E. Dowland Street	Fabricated Metal Products
Star Watch Case Company S. Rath Avenue	Watch Cases
Straits Steel & Wire Corporation N. Rowe Street	Wire Products - Fabricated
Thompson Cabinet Company E. Lake Street	Wood & Steel Equipment for Printing Trade
Western Concrete - Ludington Division 802 S. Washington Avenue	Concrete Products
Whitehall Industries 800 S. Madison	Precision Metal Machining

The occupational structure of Mason County is mainly blue collar (48.1%), followed by white collar (36.1%). The 1970 occupational structure, by profession, for Mason County and Michigan is shown in Table 8.

TABLE 8
OCCUPATIONAL STRUCTURE
1970 PERCENTAGES

Occupation	Mason County	Michigan
White Collar	36.1	44.9
Professional, technical, and kindred	10.5	14.2
Managers and administration (exc. farm)	7.8	7.0
Sales workers	5.7	6.8
Clerical and kindred	12.1	16.9
Blue Collar	48.1	40.7
Craftsmen, foremen, and kindred	18.2	15.4
Operatives (exc. transport)	19.3	17.5
Transport equipment operatives	4.6	3.8
Laborers (exc. farms)	6.0	4.0
Farm	4.0	1.5
Farmers and farm managers	2.9	1.0
Farm laborers and farm foremen	1.1	0.5
Service	11.8	12.9
Service workers	10.9	11.9
Private household workers	0.9	1.0

Source: U.S. Bureau of the Census. Census of Population: 1970.

4. Labor Market

In Mason County, the number of persons in the working age group has increased by 7.5% from 1960 to 1970. This is slightly greater than the overall population increase for Mason County during the same time period. A partial explanation for this increase may be that the scenic and environmental quality of the region has a positive effect on the labor supply.

The Mason County labor force (male/female) is given in Table 9, Total Labor Force. The percentage of females has increased by over 44% from 1960 to 1970.

TABLE 9
TOTAL LABOR FORCE
(14 years and older)
Mason County

	1960	1970	% Change
Total in Labor Force	7,875	8,792	+11.6
Male	5,737	5,700	- 0.6
% Male	75.1	70.9	--
Female	2,138	3,092	+44.6
% Female	27.5	36.2	--

Source: U.S. Census of Population, 1960 and 1970.

C. WATERBORNE COMMERCE

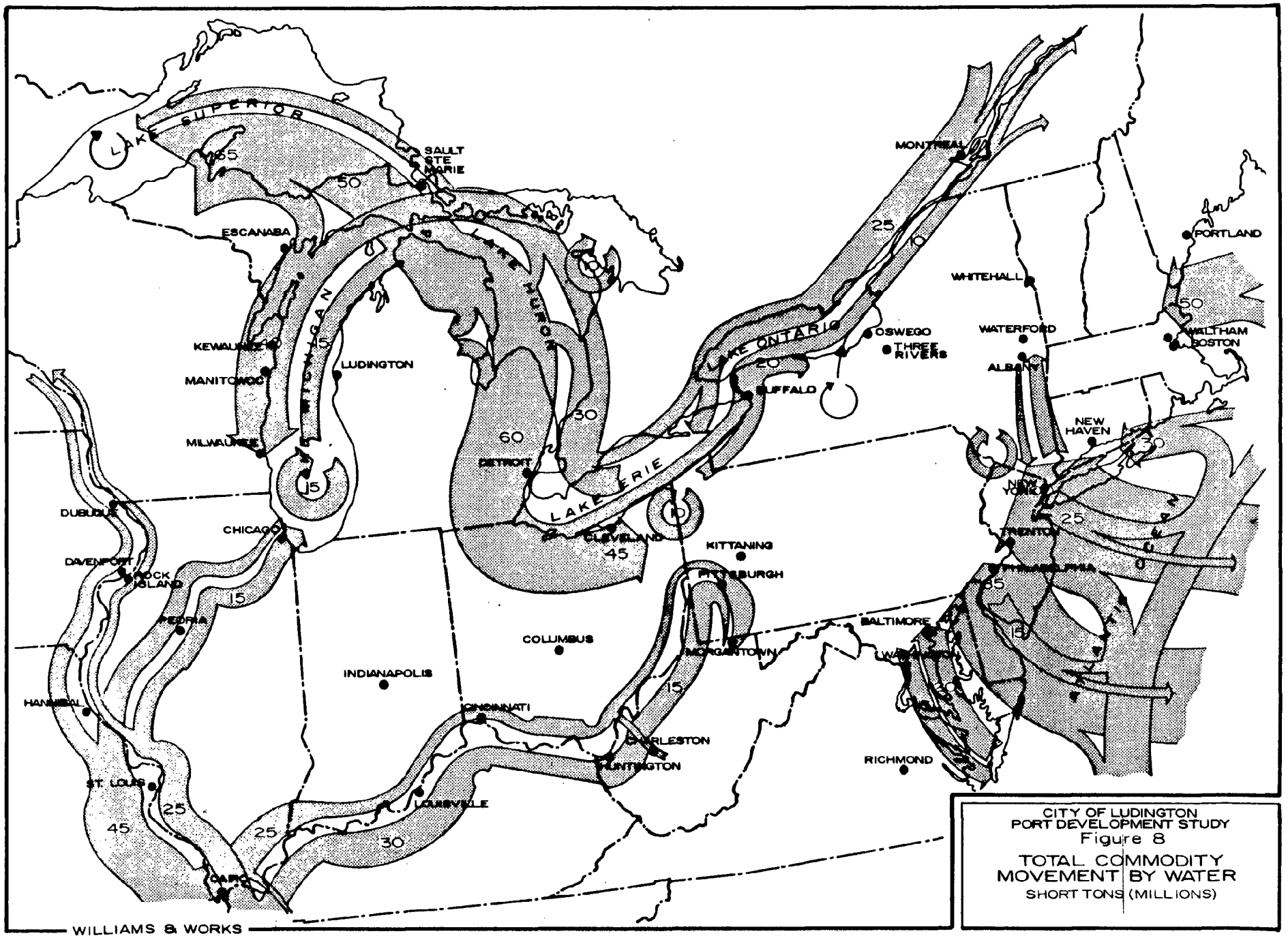
1. Commodity Flows

a. General

Total U.S. domestic waterborne commerce (internal, coastwise and Great Lakes) has shown a generally steady growth from 579 million tons in 1947 to 994 million tons in 1973, with a slight overall decline through the mid 1970's. The major component of this growth in domestic traffic during these 30 years has been the traffic on inland waterways designated as internal traffic. Coastwise traffic between ocean ports increased moderately over this period, while traffic on the Great Lakes shows a slight decline.

Total U.S. waterborne commerce, both foreign and domestic, is dominated by the energy commodities of coal, coke and petroleum products which constitute over 60% of the total. Patterns of total commodity movement are concentrated on the northeast Atlantic Coast, the Gulf Coast, the Mississippi River, the Great Lakes, and the Pacific Coast.

Waterborne commerce on the Great Lakes - St. Lawrence Seaway system (Figure 8) is a combination of domestic lakewise trade and foreign trade with Canada and overseas areas. The dominant commodity flow pattern through the Great Lakes originates in Minnesota and Michigan's Upper



CITY OF LUDINGTON
PORT DEVELOPMENT STUDY
Figure 8

TOTAL COMMODITY MOVEMENT BY WATER

SHORT TONS (MILLIONS)

WILLIAMS & WORKS

Peninsula, moves through Lake Superior to Lake Huron, and flows inland through ports along lower Lake Huron and western Lake Erie. In 1976, this total commodity movement was in the range of 60 to 80 million short tons annually between its origin and destination.

A secondary pattern of flow across the Great Lakes originates equally from two areas -- the Minnesota and Michigan Upper Peninsula area and the Upper St. Lawrence Seaway. These two flows combine near the Straits of Mackinac and move south along Lake Michigan to enter ports along its southern reaches. In 1976, this total commodity movement inland was approximately 40 million short tons.

b. Regional Flow of Foreign Imports and Exports

The entire eastern half of the United States to the Great Lakes is very productive as a producer of exports and as a consumer of imports. The bulk commodities, except for grain and crude petroleum, tend to be exported and imported through the ports nearest the state of origin or destination. The lower unit value bulk commodities do not withstand as much transportation costs as general cargo commodities and, hence, are produced or consumed near the port used for export or the port used for import.

Foreign trade is distributed nationally throughout the United States with the ports of the U.S. ocean coasts and the Great Lakes serving wide multi-state areas, particularly in the movement of general cargo commodities.

c. Major Commodity Flow Patterns

The commodities which comprise the major portion of U.S. waterborne commerce are discussed below, with particular emphasis on flow patterns through the Great Lakes system.

(1) Coal

The Great Lakes has substantial traffic moving from established coal shipping points on Lake Erie and Lake Michigan to U.S. and Canadian

Great Lakes harbors (Figure 9). A newly emerging pattern is created by the movement of coal from the Western Mountain states and Great Plains states to eastern, southern, and western markets. One of the new routes developed since 1974 is the movement of western coal from Montana by rail to the port of Duluth/Superior and from there by 1,000-foot ships, popularly called superlakers, from Lake Superior to the lower Great Lakes ports, such as Detroit and Chicago. The Great Lakes provide the means of transport for about 38 million tons of coal from ports in the western half of Lake Erie to U.S. destinations on all the Great Lakes, as well as to Canadian destinations in the previous pattern of movement.

(2) Crude Petroleum

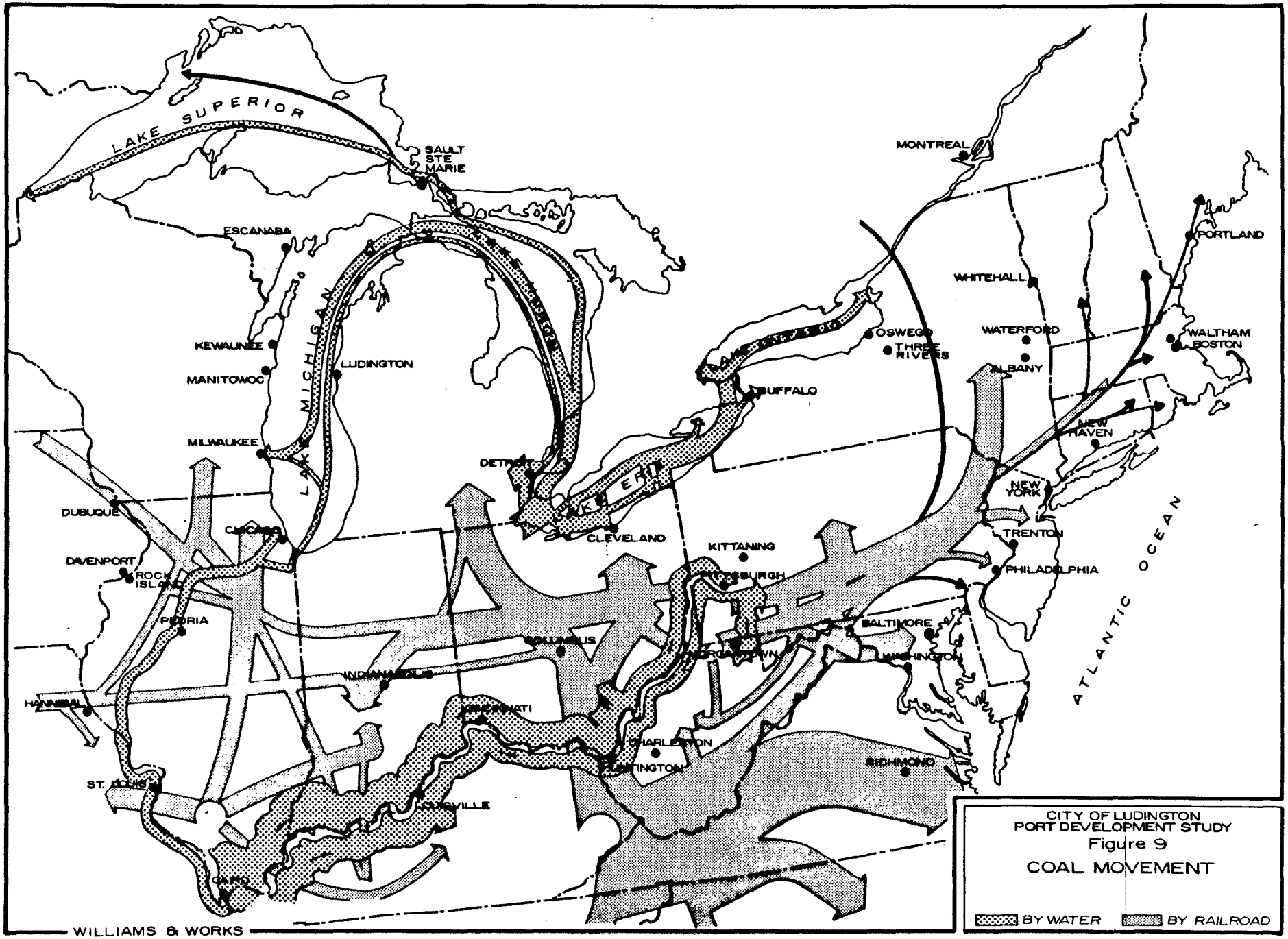
The dominant water movement of crude petroleum in the U.S. (Figure 10) is its import into the New York/New Jersey/Delaware River area on the East Coast, and the Texas/Louisiana area on the Gulf Coast. Crude petroleum is not a waterborne commodity of major significance on the Great Lakes, since Michigan and Wisconsin have a well developed pipeline network.

(3) Refined Petroleum

Refined petroleum commodity flows (Figure 11) show similarities to crude petroleum. However, pipeline flow is proportionately more significant than for crude petroleum. Refined petroleum products move up and down on the Great Lakes. On Lake Michigan, refined petroleum moves from Chicago to cities along the Michigan and Wisconsin coasts.

(4) Iron Ore

The waterborne transport of iron ore dominates the Great Lakes/ St. Lawrence Seaway system (Figure 12). Iron ore from mines and pelletizing plants in the Lake Superior region is moved by lakeships to steel mills in the lower lakes region. High volumes of imported iron ore are moved from eastern Canada up the St. Lawrence Seaway to the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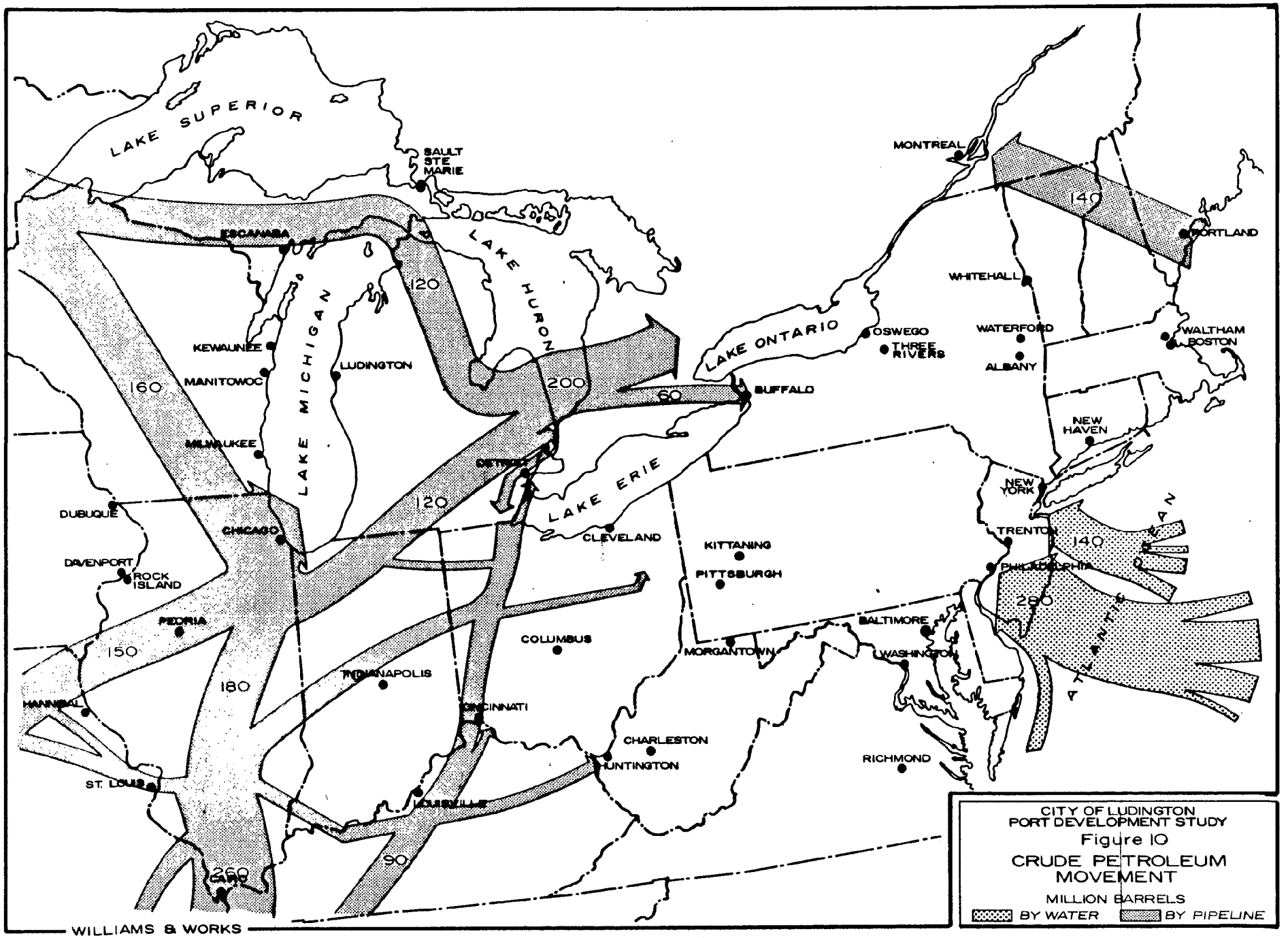
PORT DEVELOPMENT STUDY
Figure 9
COAL MOVEMENT
BY WATER
BY RAILROAD
WILLIAMS & WORKS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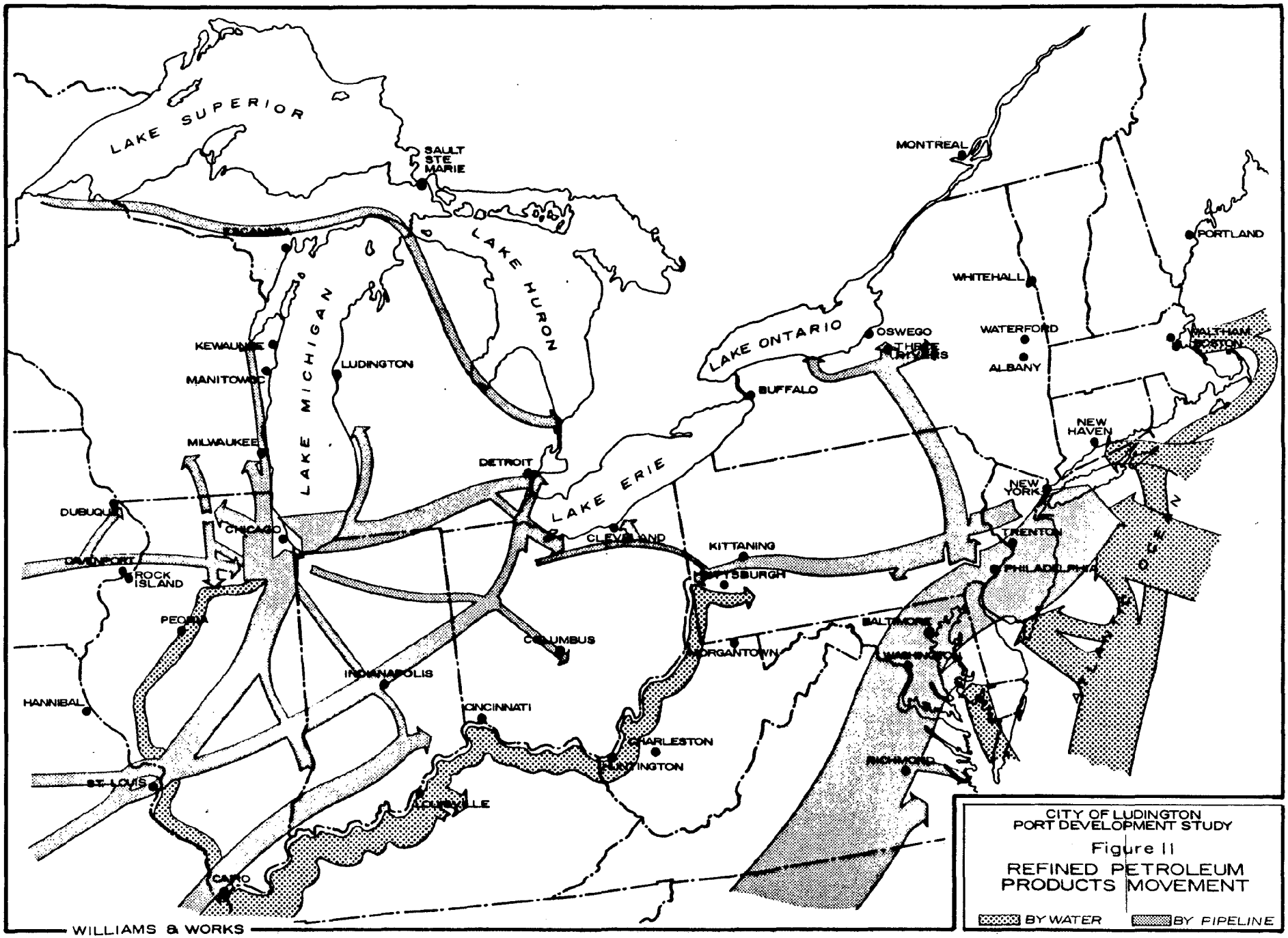
WILLIAMS & WORKS
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY
Figure 10
CRUDE PETROLEUM MOVEMENT
MILLION BARRELS
BY WATER
BY PIPELINE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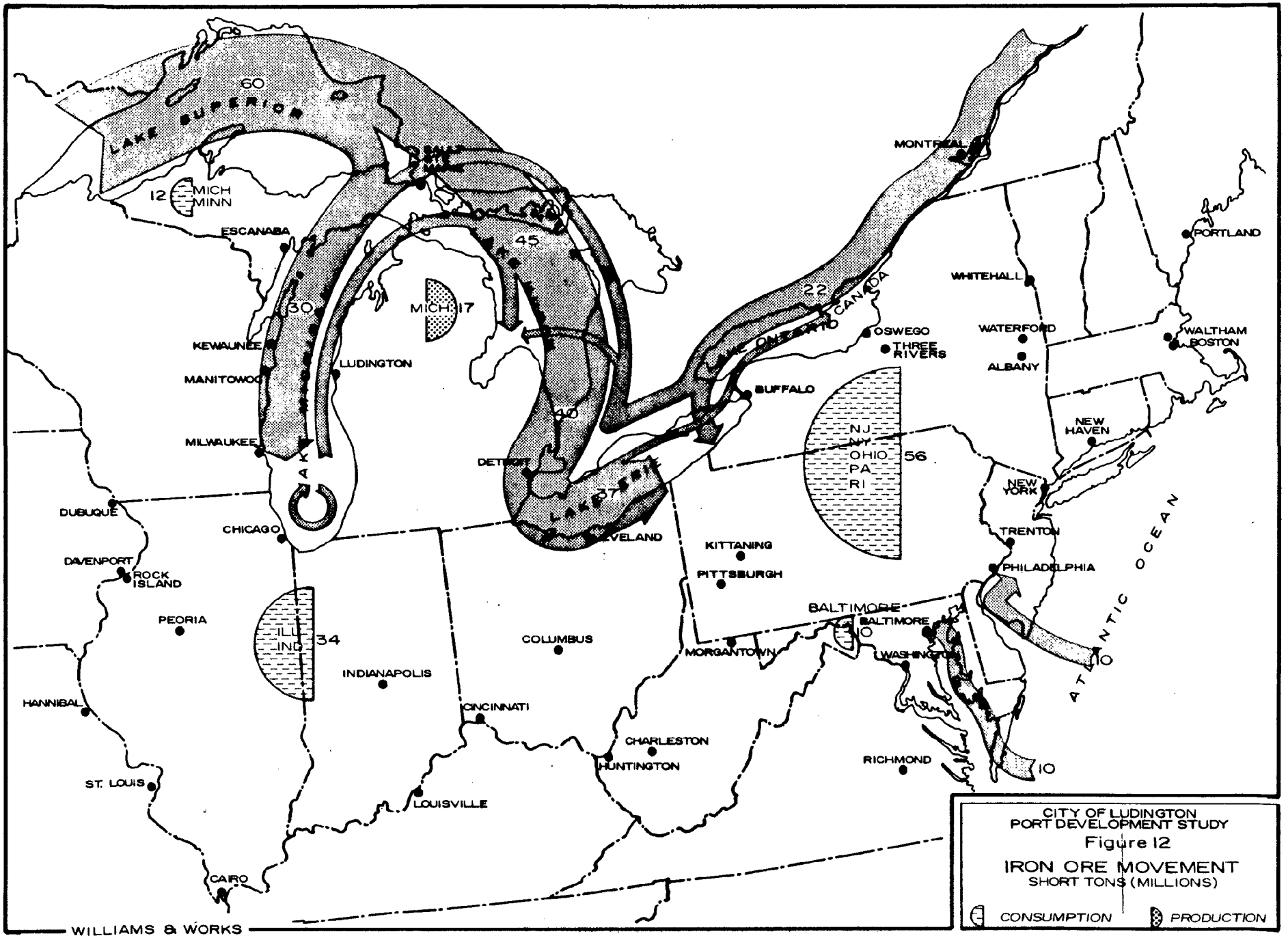
PORT DEVELOPMENT STUDY
Figure 11
REFINED PETROLEUM PRODUCTS MOVEMENT
BY WATER
BY PIPELINE
WILLIAMS & WORKS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WASHINGTON
RICHMOND
ATLANTIC OCEAN
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY
Figure 12
IRON ORE MOVEMENT
SHORT TONS (MILLIONS)
CONSUMPTION
PRODUCTION
WILLIAMS & WORKS

steel mills on and near the lower Great Lakes. Served by Great Lakes ports, this region accounts for about two-thirds of the steel production in the U.S.

(5) Iron and Steel Products

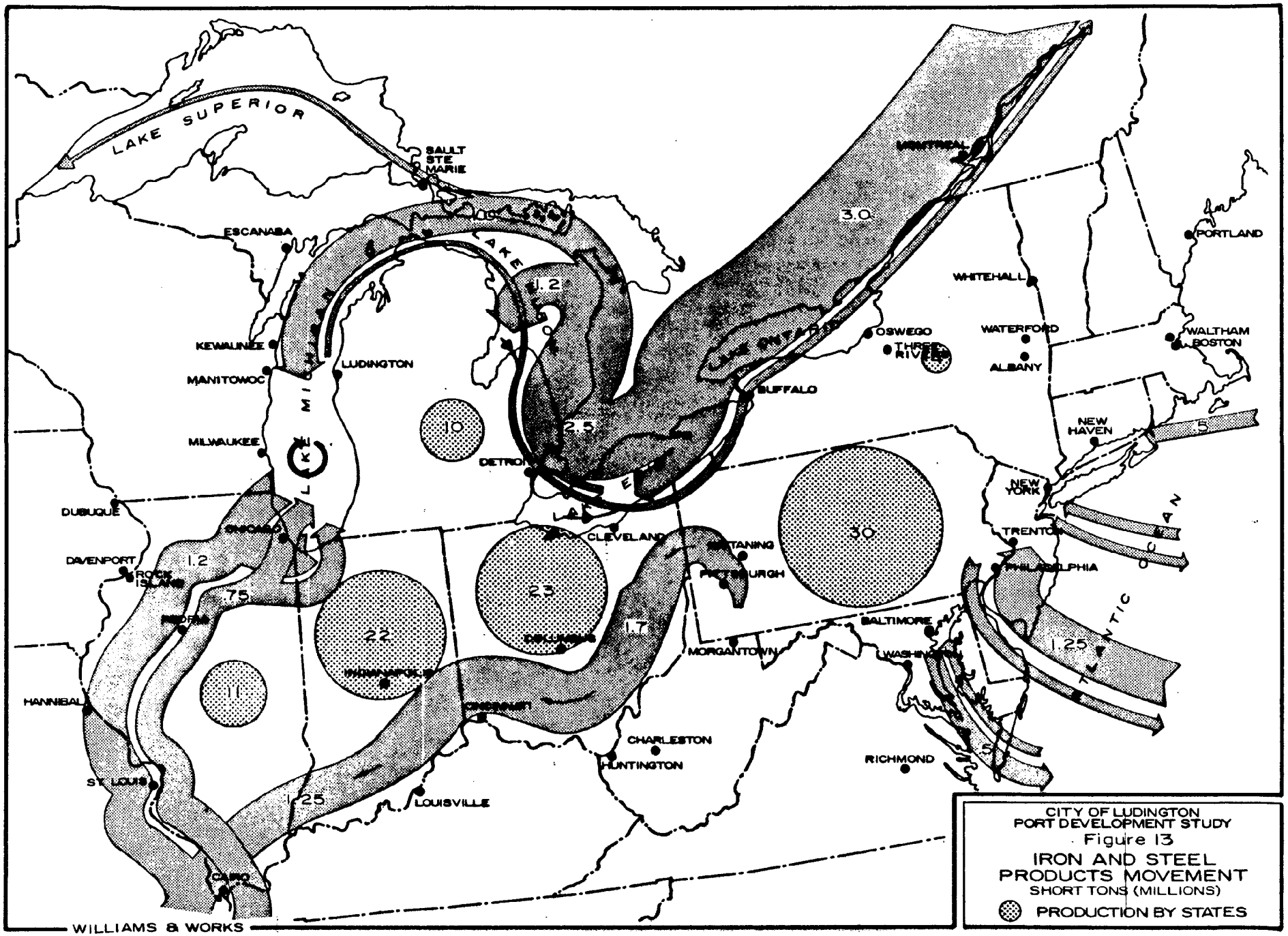
Large volume iron and steel movements occur on the St. Lawrence Seaway (Figure 13). Although movements occur as both imports and exports, imports are the major flow. The Great Lakes area, with its automotive, machinery and metal fabricating industries, is a heavy consumer of iron and steel products, both domestic and foreign. Here also is the largest concentration of steel production in the United States. With the exception of the Baltimore region, where exports of iron and steel products exceed imports, other coastal harbor areas are shown to be net importers of iron and steel products.

(6) Grain

Grain (Figure 14) moves from Minnesota, Montana, and North Dakota by rail and truck to the port of Duluth/Superior on Lake Superior for export shipment by the St. Lawrence Seaway, or to be shipped through ports such as Buffalo for domestic use. A secondary flow of grain from farms in Iowa, Wisconsin, and Illinois moves north from Chicago and Milwaukee along Lake Michigan to join this export flow. Grain from Ohio and Indiana moves through to Toledo.

(7) Industrial and Agricultural Chemicals

The waterborne movement of agricultural and industrial chemicals in the U.S. presents a complex pattern. Industrial chemicals manufactured in the Gulf area and from Texas to Louisiana are shipped up the Mississippi River and tributaries and to export. There is substantial movement of industrial chemicals from the Gulf to both east and west coasts of the U.S. In the Great Lakes system (Figure 15), the flow patterns for both industrial and agricultural chemicals are similar to those described for grain movement.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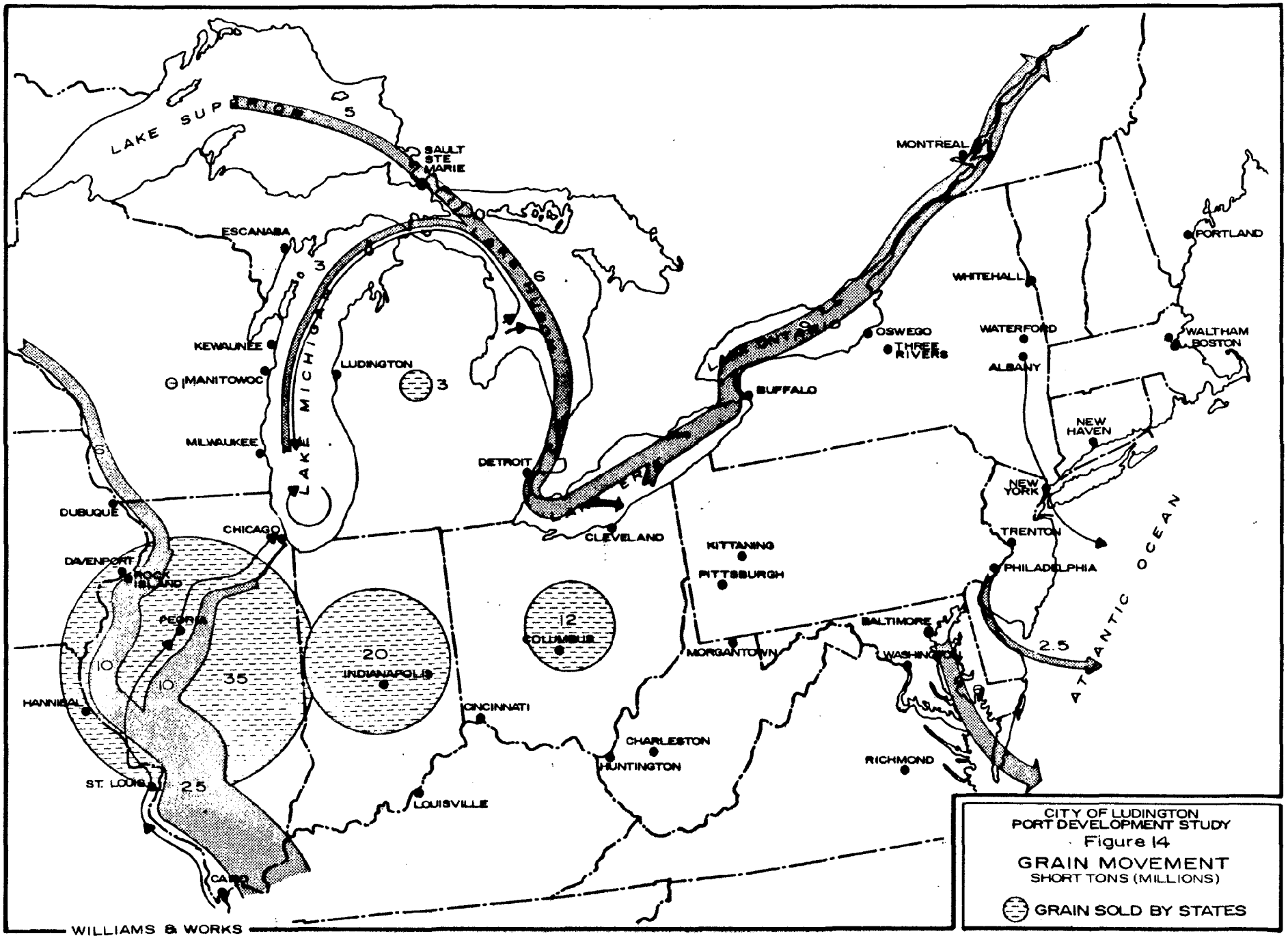
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY
Figure 13
IRON AND STEEL
PRODUCTS MOVEMENT
SHORT TONS (MILLIONS)
PRODUCTION BY STATES
WILLIAMS & WORKS



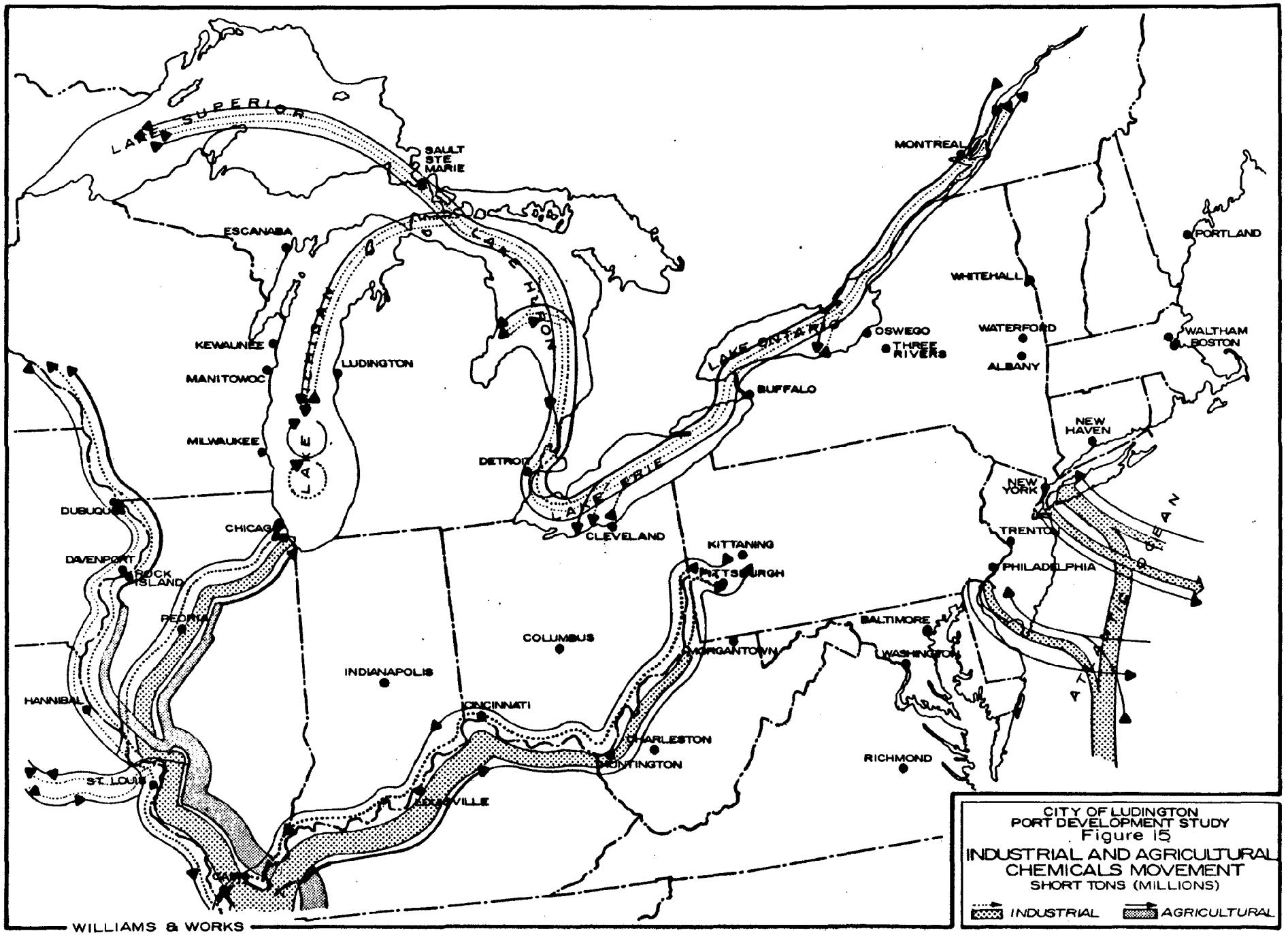
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

Figure 14

GRAIN MOVEMENT
SHORT TONS (MILLIONS)

GRAIN SOLD BY STATES

WILLIAMS & WORKS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CHARLESTON
HUNTINGTON
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY
Figure 15
INDUSTRIAL AND AGRICULTURAL CHEMICALS MOVEMENT
SHORT TONS (MILLIONS)
INDUSTRIAL
AGRICULTURAL
WILLIAMS & WORKS

d. Volume of Commodity Flows Through Major Ports on the Great Lakes

The total freight carried through Lake Michigan ports in 1976 was 104,500,000 tons. Table 10 shows a breakdown of tonnage, by lake, for ports in the Great Lakes. Lake Michigan is seen to have approximately 30.7% of the total Great Lakes tonnage. Only Lake Erie carries a larger percentage - 38.5% (131,100,000 tons) - through its ports.

TABLE 10
MAJOR U.S. GREAT LAKES PORTS
WATERBORNE COMMERCE 1976
(in millions of short tons)

Port	Domestic Commerce	Foreign Commerce	Total Commerce	
Lake Michigan			104.5	(30.4%)
Chicago/Calumet Harbor, IL	33.7	6.9	40.6	
Indiana Harbor, IN	16.7	2.8	19.5	
Buffington, IN	N/A	N/A	2.2	
Gary, IN	N/A	N/A	9.9	
Burns Waterway, IN	5.1	.4	5.5	
Muskegon, MI	2.2	*	2.2	
Ludington, MI	2.3	*	2.3	
Port Inland, MI	N/A	N/A	3.4	
Escanaba, MI	N/A	N/A	11.9	
Green Bay, WI	2.1	.2	2.3	
Port Washington, WI	1.1	*	1.1	
Milwaukee, WI	2.7	.9	3.6	
Lake Superior			71.0	(20.6%)
Duluth/Superior, MN	28.6	4.0	32.6	
Two Harbors, MN	N/A	N/A	8.3	
Silver Bay, MN	N/A	N/A	11.0	
Taconite, MN	N/A	N/A	12.2	
Presque Isle, MI	5.7	1,2	6.9	
Lake Huron			36.4	(10.6%)
Port Dolomite, MI	N/A	N/A	3.5	
Calcite, MI	N/A	N/A	11.3	
Drummond Island, MI	2.1	.5	2.6	
Stone Port, MI	N/A	N/A	9.8	
Alpena, MI	2.7	.1	2.8	
St. Clair, MI	3.1	.2	3.3	
Saginaw River, MI	N/A	N/A	3.1	

Port	Domestic Commerce	Foreign Commerce	Total Commerce	
Lake Erie			131.1	(38.1%)
Detroit, MI	21.0	5.4	26.4	
Toledo, OH	16.3	8.7	25.0	
Marblehead, OH	N/A	N/A	1.4	
Sandusky, OH	2.3	3.1	5.4	
Huron, OH	2.4	.5	2.9	
Lorain, OH	7.0	.5	7.5	
Cleveland, OH	13.7	4.5	18.2	
Fairport, OH	2.3	.4	2.7	
Ashtabula, OH	6.1	5.6	11.7	
Conneaut, OH	8.5	7.9	16.4	
Erie, PA	1.0	.2	1.2	
Buffalo, NY	8.6	3.7	12.3	
Lake Ontario			.9	(.3%)
Oswego, NY	N/A	N/A	.9	
TOTAL - MAJOR PORTS			343.9	(100%)

Source: National Waterways Study, Part 3, The Great Lakes, U.S. Army Corps of Engineers
N/A = Not available on a domestic/foreign basis
* = Less than 100,000 tons

Table 11 shows total Michigan port tonnages for 1978. This table indicates that activity on the Lake Huron side is concentrated in the areas of Detroit, Port Calcite, Stoneport, Saginaw, and Alpena. Conversely, activity on Lake Michigan is fairly evenly distributed, with the exception of Chicago being a concentrated area. Total tonnage for many smaller Michigan ports has decreased since 1971, while medium to larger port activity has remained fairly constant.

TABLE 11
MICHIGAN PORT TONNAGES FOR 1978

Harbor	1978 Tonnage	% of State Total
Detroit (Port of)	25,881,508	25.5
Escanaba	13,207,490	13.0
Port Calcite	11,699,229	11.5
Stoneport	9,217,883	9.1
Marquette-Presque Isle	8,043,758	7.9
Port Dolomite	3,633,718	3.6
Port Inland	3,585,239	3.5
St. Clair	3,319,786	3.3
Alpena	3,203,682	3.2
Saginaw River	3,173,573	3.1
Port Drummond	2,578,354	2.6
Ludington	2,397,920	2.4
Monroe	2,374,166	2.3
Muskegon	1,952,476	1.9
Grand Haven	701,717	0.7
Alabaster	683,104	0.7
Port Huron	647,097	0.6
Port Gypsum	631,274	0.6
Frankfort-Elberta	542,449	0.5
Marysville	529,920	0.5
Port Penn Dixie	428,934	0.4
Traverse City	426,212	0.4
Holland	419,916	0.4
Marine City	324,653	0.3
St. Joseph-Benton Harbor	320,633	0.3
Gladstone	298,847	0.3
Harbor Beach	253,711	0.2
Manistee	183,806	0.2
Charlevoix	163,212	0.2
Menominee-Marinette	137,417	0.1
Cheboygan	134,827	0.1
Keweenaw Waterway	131,689	0.1
Lime Island	95,301	0.1
Mackinaw City	90,251	0.1
Sault Ste. Marie	62,349	0.1
Algonac	23,844	0.1
Mackinac Island	14,917	0.1
Harrisville	7,104	0.1
St. James	6,898	0.1
Leland	924	0.1
	101,529,788	100.0%

Source: Michigan Port Needs Study, 1981.

e. Commodity Flows Through Ludington

The historic pattern of waterborne commerce through the port at Ludington is shown in Table 12.

TABLE 12
HISTORICAL PATTERN OF TOTAL WATERBORNE COMMERCE
LUDINGTON, MICHIGAN

Year	Tonnage
1969	3,664,748
1970	4,643,609
1971	4,258,442
1972	3,368,015
1973	2,557,086
1974	2,178,835
1975	2,123,507
1976	2,338,774
1977	2,448,983
1978	2,397,920
1979	2,764,880
Mean Annual	2,976,799

Domestic freight traffic, by commodity for 1979, is shown in Table 13. Due to the overlap in categories, it is not possible to break out tonnages for individual shippers.

TABLE 13
DOMESTIC FREIGHT TRAFFIC BY COMMODITY, 1979
LUDINGTON, MICHIGAN
(short tons)

Commodity	Receipts	Shipments	Total
Barley and Rye	2,426	--	2,426
Corn	160	--	160
Wheat	60	--	60
Hay and Fodder	80	--	80
Field Crops, NEC	6,110	--	6,110
Animals and Products, NEC	115	--	115
Miscellaneous Farm Products	3,255	220	3,475
Copper Ore and Concentrates	--	1,308	1,308
Nonferrous Ores, Conc., NEC	80	853	933
Coal and Lignite	19,453	28,914	48,367
Limestone	924,735	--	924,735
Sand, Gravel, Crushed Rock	18,700	375,550	394,250
Clay	--	510	510
Natural Fertilizer Mats, NEC	--	60	60
Sulphur, Dry	--	3,710	3,710

Commodity	Receipts	Shipments	Total
Nonmetallic Minerals, NEC	74	149,735	149,809
Meat, Fresh, Chilled, Frozen	2,173	--	2,173
Dairy Products, NEC	6,716	190	6,906
Dried Milk and Cream	370	172	542
Vegetables and Prep, NEC	12,906	3,372	16,278
Prep Fruit and Veg Juice, NEC	40	783	623
Wheat Flour and Semolina	41,301	--	41,301
Prepared Animal Feeds	23,031	--	23,031
Grain Mill Products, NEC	70,908	100	71,008
Sugar	860	--	860
Alcoholic Beverages	5,137	--	5,137
Miscellaneous Food.Products	7,745	2,051	9,796
Timber, Posts, Poles, Piling	200	--	200
Pulpwood, Log	13,221	23,358	36,579
Lumber	37,402	5,161	42,563
Veneer, Plywood, Worked Wood	13,876	60	13,936
Wood Manufactures, NEC	4,294	50	4,344
Furniture and Fixtures	298	--	298
Pulp	5,348	980	6,328
Standard Newsprint Paper	9,966	11,766	21,732
Paper and Paperboard	134,286	56,599	190,885
Pulp and Paper Products, NEC	1,590	32,037	33,627
Basic Chemicals and Prod, NEC	--	331,181	331,181
Miscellaneous Chemical Prod	7,180	101,873	109,053
Rubber and Misc Plastic Prod	18,640	4,312	22,952
Leather and Leather Products	--	2,543	2,543
Glass and Glass Products	--	1,188	1,188
Building Cement	--	11,195	11,195
Structural Clay Products	--	642	642
Slag	38,160	--	38,160
Iron and Steel Plates, Sheets	--	6,173	6,173
Iron and Steel Pipe and Tube	--	4,633	4,633
Iron and Steel Products, NEC	2,655	215	2,870
Aluminum and Alloys, Unworked	190	--	190
Fabricated Metal Products	465	1,454	1,919
Machinery, Except Electrical	15,906	1,241	17,147
Motor Vehicles, Parts, Equip	--	27,124	27,124
Ships and Boats	175	--	175
Misc Manufactured Products	45,561	59,137	104,698
Iron and Steel Scrap	10,460	5,609	16,069
Paper Waste and Scrap	275	2,140	2,415
Waste and Scrap	106	--	106

f. Cross-Lake Passengers

Cross-lake passenger traffic, for the eleven-year period of 1969-1979, is given in Table 14 for the Ports of Ludington, Frankfort, and Muskegon. The peak year for total cross-lake passenger traffic was 1970, and the peak year for Ludington's passenger traffic was 1971. Total passenger

traffic has averaged 204,569 people per year and has been generally declining. Ludington passenger traffic has averaged 165,469 people per year and has also been generally declining.

TABLE 14
CROSS-LAKE PASSENGER TRAFFIC
1969 - 1979

Year	Ludington	Muskegon	Frankfort	Total
1969	174,224	101,096	25,225	300,545
1970	177,353	111,594	22,577	311,524
1971	205,389	742	29,666	235,797
1972	176,598	-	21,614	198,212
1973	179,055	-	15,076	194,131
1974	188,426	-	13,021	201,447
1975	149,251	-	14,077	163,328
1976	156,218	-	13,410	169,628
1977	169,871	-	17,449	187,320
1978	110,006	-	28,451	138,457
1979	133,765	-	16,105	149,870
				2,250,259

Chapter II

Existing Harbor Facilities

CHAPTER II
EXISTING HARBOR FACILITIES

INTRODUCTION

The objective of this chapter is to present the information on existing commercial facilities in the Ludington Harbor gathered during an on-site inventory and review. This review consisted of field observations of the existing components of each facility with regard to structural condition and need for general repairs. An evaluation of the site was made to ascertain the need for, or availability of, land for expansion. This chapter also addresses the functional viability of related facilities and intermodal connections. Input from the operators of these facilities was requested regarding viability, and is included in this chapter.

The intent of this information is to provide an overview of the quality of existing harbor facilities, to identify significant deficiencies, and to determine the type of repairs and new construction that would be involved in an upgrading effort. The detailed information which is required beyond the planning stage, such as structural analysis of specific components in order to design repairs or a replacement, is not included in this review.

A. EXISTING HARBOR FACILITIES

An outer basin, formed by arrowhead breakwaters, protects the channel connecting Lake Michigan and Pere Marquette Lake. The breakwaters are 550 feet apart at the outer ends, diverging at a 90-degree angle. The north and south breakwaters have lengths of 1,800 feet and 1,600 feet, respectively. The inner channel is 2,000 feet in length and has a navigable width of about 230 feet.

The recently completed Ludington Municipal Marina occupies the northernmost shores of Pere Marquette Lake, just inside the inner channel. A rubble mound wave absorber and steel sheet pile revetment also have recently been constructed along the southern edge of the inner channel and turn into Pere Marquette Lake. These improvements were part of the project for modification of the harbor and channel at Ludington.

The Ludington Yacht Club and Ludington Outboard Club have private docking facilities on the northeast shores of Pere Marquette Lake. Major commercial docks on the lake are operated by the C&O Railroad for ferry docking, by The Dow Chemical Company, and by Sand Products, Inc. Figure 16 shows the major harbor structures, along with harbor dimensions and controlling depths.

B. ON-SITE REVIEW OF EXISTING COMMERCIAL FACILITIES

1. Chesapeake & Ohio Railroad Car Ferry

A site plan of the C&O Railroad Ferry slips and docks are shown in Figure 17. The railroad currently operates one ferry run per day between Ludington and Kewaunee, Wisconsin, and is using only Slip 2. The steel sheet pile docks located between Slips 1 and 2, Slips 2 and 3, and south of Slip 3 are referred to as docks 1-1/2, 2-1/2 and 3-1/2, respectively. The long wing fender and pile clusters at Slip 1 were removed in 1982. Slip 3 is currently not in use due to damage and may be removed in the near future by a private firm under contract with the C&O Railroad.

a. Car Ferry Slip 2

The following information is presented for this slip only as it is the only one in current use and may be the only remaining slip in the future. Significant differences in Slips 2 and 3, in addition to a discussion of their damages, follows:

(1) Components and Materials of Construction

The car ferry slip consists of a long-wing fender or pier, a hinged apron or bridge for loading railroad cars onto the ferry, a ramp for loading automobiles on the mid-level of the ferry, a passenger loading ramp, and several piling clusters for ferry turning and mooring.

Figure 18 is a view of the end of the long-wing fender at Slip 2. It consists of three rows of creosote treated timber piling with a butt diameter of 18 to 24 inches. The pilings are separated by double rows of 3" x 12" creosote treated cross members. The vertical facing

LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN
Figure 16

HARBOR STRUCTURES AND CHANNEL DIMENSIONS

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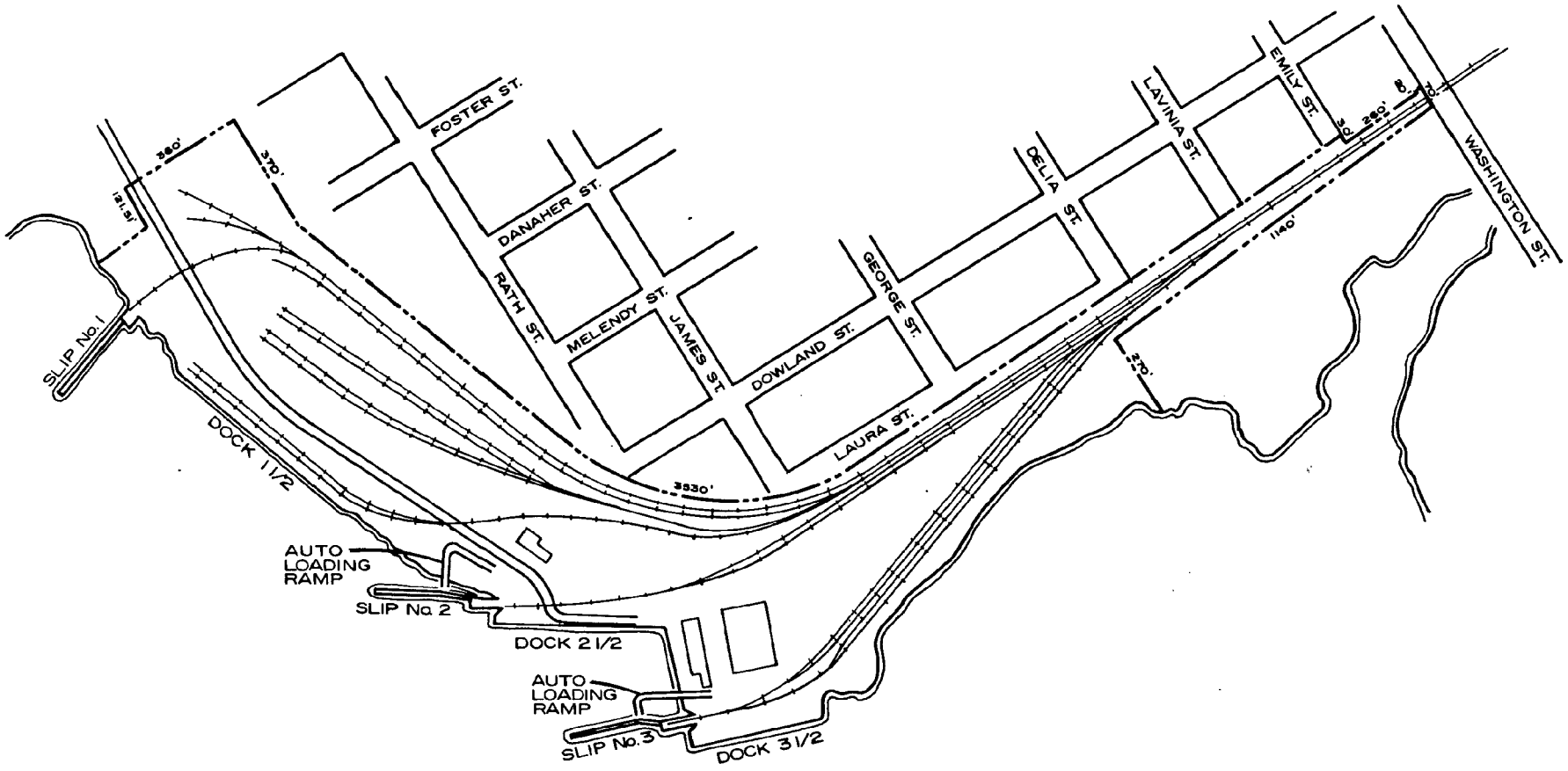

LUDINGTON
PORT DEVELOPMENT STUDY
Figure 17
C & O SITE PLAN

NO SCALE

MARCH, 1982

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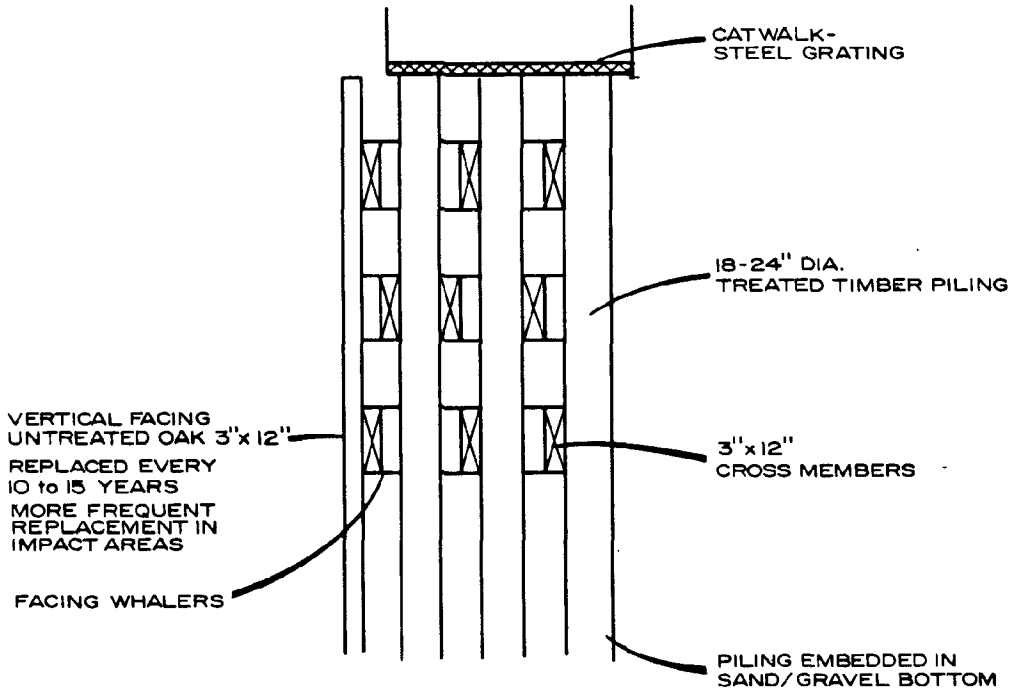


Figure 18
CROSS-SECTIONAL VIEW
OF LONG-WING FENDER
CAR FERRY SLIP No. 2
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

boards, which are in contact with the docked ferry, are 3" x 12" untreated oak. Along the top of the long-wing fender is a metal grating catwalk.

The turning pile cluster is located at the end of the long-wing fender to facilitate maneuvering and turning of the ferry and to protect the fender from impact. Figure 19 shows a cross-section view of the pile cluster. The inner pile core and outer row of piling are separated by numerous wraps of neoprene tubing, 6 inches in diameter, held in place with a steel cable through the center. This tubing functions as a shock absorber within the pile cluster. The cluster is wrapped on the outside with 3/4" steel cable. There are approximately 50+ creosote treated piles in this cluster.

In addition to the turning pile cluster, the slip has a lining cluster of 25-30 treated piles located midway along the long-wing fender. An opposite cluster is located next to the apron and across from the fender to facilitate docking.

The apron or bridge includes a wood platform which is hinged at the dock side and raised and lowered with a counter weight system. The bridge surface is constructed of treated 12" x 12" timbers, with rail tracks on each side to allow loading and unloading of both sides of the ferry. During loading and unloading, the apron rests in a pocket at the stern of the ferry.

The auto and passenger loading ramps are behind the long-wing fender near the apron area. The auto ramp is a wood structure supported by treated timber piling and cross members. Figure 20 shows a photo of the support structure of the auto loading ramp.

The passenger ramp is a staircase supported by concrete-encased structural steel piling.

(2) History of Repairs and Current Conditions of Components

Most components of ferry Slip 2 are generally in good condition. The original date of construction of the slip is not known. It was

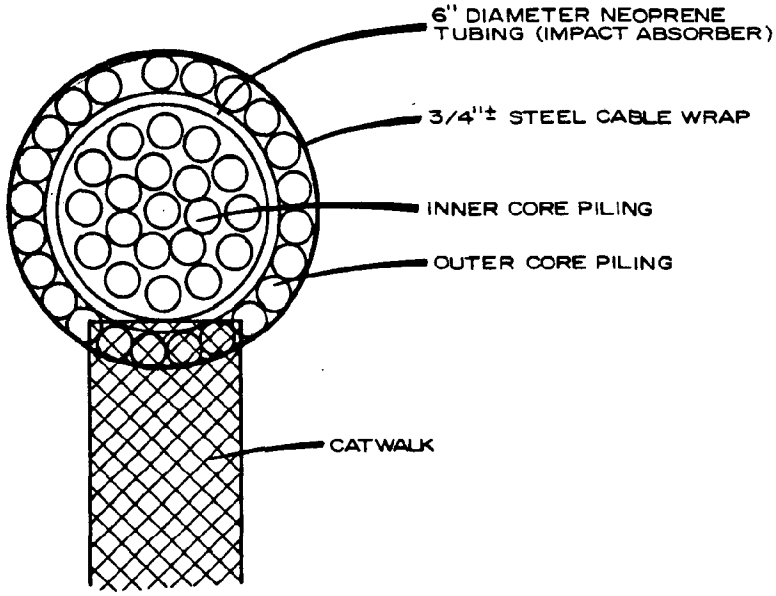


Figure 19
CROSS-SECTIONAL VIEW OF
TURNING PILE CLUSTER
CAR FERRY SLIP No. 2
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

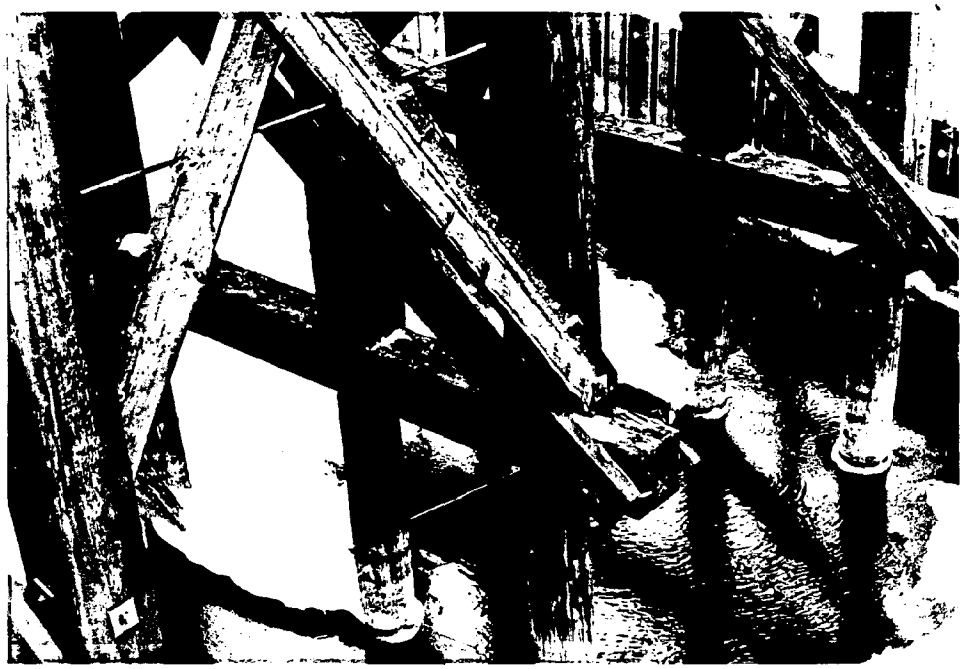


Figure 20
AUTO RAMP
SUPPORT PILING
CAR FERRY SLIP No. 2
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

completely rebuilt in the late 20's or early 30's. The long-wing fender is showing some signs of impact midway along its length and is beginning to lean slightly toward the shore. The oak facing along this fender is replaced as needed, usually every 10-15 years, and more frequently in high impact areas.

The turning pile cluster, which was completely rebuilt in the 1950's, is also in good condition. The original construction of this piling reportedly failed, breaking off at the point of penetration. The condition of the lining cluster pile is good, with slight damage to the exterior piling. Figure 21 is a photo of this piling. The opposite pile cluster, which can be seen in the background of the photo, is in fair condition and beginning to lean away from the docking area.

The auto and passenger ramps are in generally good condition, with no visible signs of rot or decay. The bridge is also in good condition. Maintenance on this structure, involving timber replacement, is reportedly done on a regular basis to insure that rail alignment is maintained.

b. Car Ferry Slip 1

Ferry Slip 1 has the same basic components as Slip 2. However, it is lacking an auto and passenger ramp and has a shorter apron. This ferry slip was the original docking facility for ferry runs across Lake Michigan. In the mid 1970's, the slip was taken out of service when the bridge or apron was damaged by a ferry during unloading. It has not been repaired or used since that time.

In 1982, the long wing fender and pile clusters were removed at Slip 1. The long-wing fender of Slip 1 was not in good condition at the time of removal, leaning away from the dock area approximately 10°-15°.

Reportedly, the configuration of Slip 1 has several inherent disadvantages. The orientation of the slip made docking difficult during strong northerly winds. The short bridge did not accommodate wide or long railroad cars well and was less secure in the ferry pocket than the longer

Figure 21
LINING CLUSTER PILE
AND OPPOSITE PILE
CAR FERRY SLIP No. 2
CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

bridges at Slips 2 and 3. Finally, the railroad tracks leading up to the bridge are on a fairly sharp curve; occasionally, train derailments resulted.

c. Car Ferry Slip 3

Slip 3 has severe long-wing fender damage and currently is inoperable. Figure 22 is a photo of the the long-wing fender taken from the bridge. This damage, which reportedly is the result of impact during docking, has caused the collapse of the long-wing fender and turning cluster piling.

The original date of construction of Slip 3 is unknown. It was in service when two ferries were running per day up to a year ago, but was damaged and beginning to lean severely at that time. The components of Slip 3 are similar to those of Slip 2 with the exception that the auto ramp is constructed of steel rather than wood. Other components of the slip, aside from the piling clusters and long-wing fender, are generally in fair to good condition. As mentioned previously, Slip 3 may be removed in the near future.

d. Sheet Pile Dock 1-1/2

The location of this docking area is shown in Figure 17. It consists of steel sheet pile with a steel cap over the top of the piling. Rubber tires are attached along the face to provide some protection against impact. The dock has concrete-filled steel mooring bollards spaced approximately every 30 feet.

Currently, this dock is used by a local asphalt firm to unload bulk sand and aggregate from self-unloading barges moored at the dock. The bulk material is unloaded and piled approximately 50 feet from the dock face on the landward side of the railroad tracks.

This dock piling was installed in the late 50's and is generally in good condition. Some of the steel plate across the top has become dislodged and bent in places. One of the mooring bollards has also been dislodged.

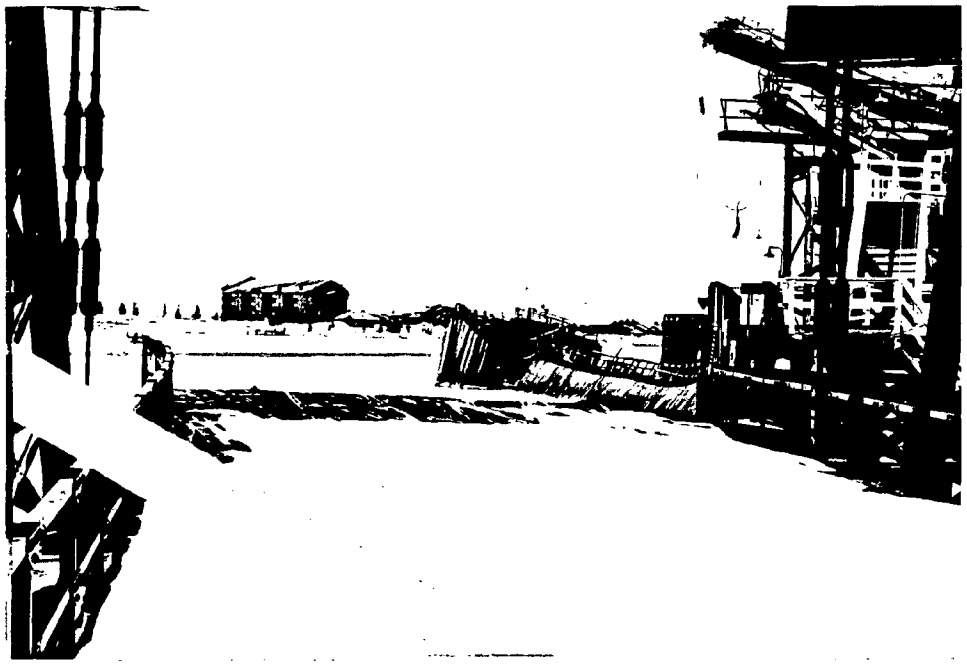


Figure 22
SLIP 3
LONG-WING FENDER

CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

e. Sheet Pile Docks 2-1/2 and 3-1/2

Dock 2-1/2 is located between Slips 2 and 3 and is about half as long as Dock 1-1/2. Date of construction of the dock is not known. The dock is constructed of steel sheet pile with untreated wood whalers.

The sheet pile is in good condition with the exception of the westerly 100 feet. The top 1 to 2 feet of this piling has been bent, probably due to impact. The wood whalers show evidence of impact damage along the length of the dock and are in fair condition. Reportedly, the whalers have been replaced as necessary in the past, usually every 10 years.

Dock 3-1/2 is generally of the same construction as 2-1/2 and is in good condition, with some impact damage to the whalers. Currently, docks 2½ and 3½ are used for ferry mooring for maintenance and repairs.

f. Site Considerations

The Site Plan of the C&O property is shown in Figure 17. Aside from the land adjacent to dock 1-1/2, there is little vacant land. Rail spurs which extend to each of the slips occupy a major portion of the land. Buildings on the site are the marine shop, marine store, roundhouse, and four storage buildings.

g. Functional Viability

The general purpose dock (1-1/2) is adequate for small vessels and barges. It is presently being used by Laman Asphalt for landing and storage of bulk materials. Stockpiling of heavy materials is limited to the landward side of the railroad tracks due to the potential of seawall failure at this facility. This dock could be used, with substantial improvements, for lake ships. However, tugboat assistance would be necessary for leaving the dock during times of strong west winds. The general purpose dock has good rail access and limited over-the-road access. This dock is served by full utilities.

At present, only one slip (2) is functional for car ferry service and the other two sheetpile docks (2-1/2 and 3-1/2) are being used for vessels in layup. The car ferry terminal facilities are supported by the following:

(1) Machine shop (car ferry maintenance and supplemental freight yard maintenance)
(2) Marine storage (storage of supplies for car ferries, such as food, linen, etc.)
(3) Roundhouse (eastbound and westbound railroad yard; no piggyback facilities)
(4) Paint shop (supply and maintenance for marine structures)
(5) Storage buildings (four individual storage buildings)

The C&O Railroad considers the single serviceable slip as adequate for present use.

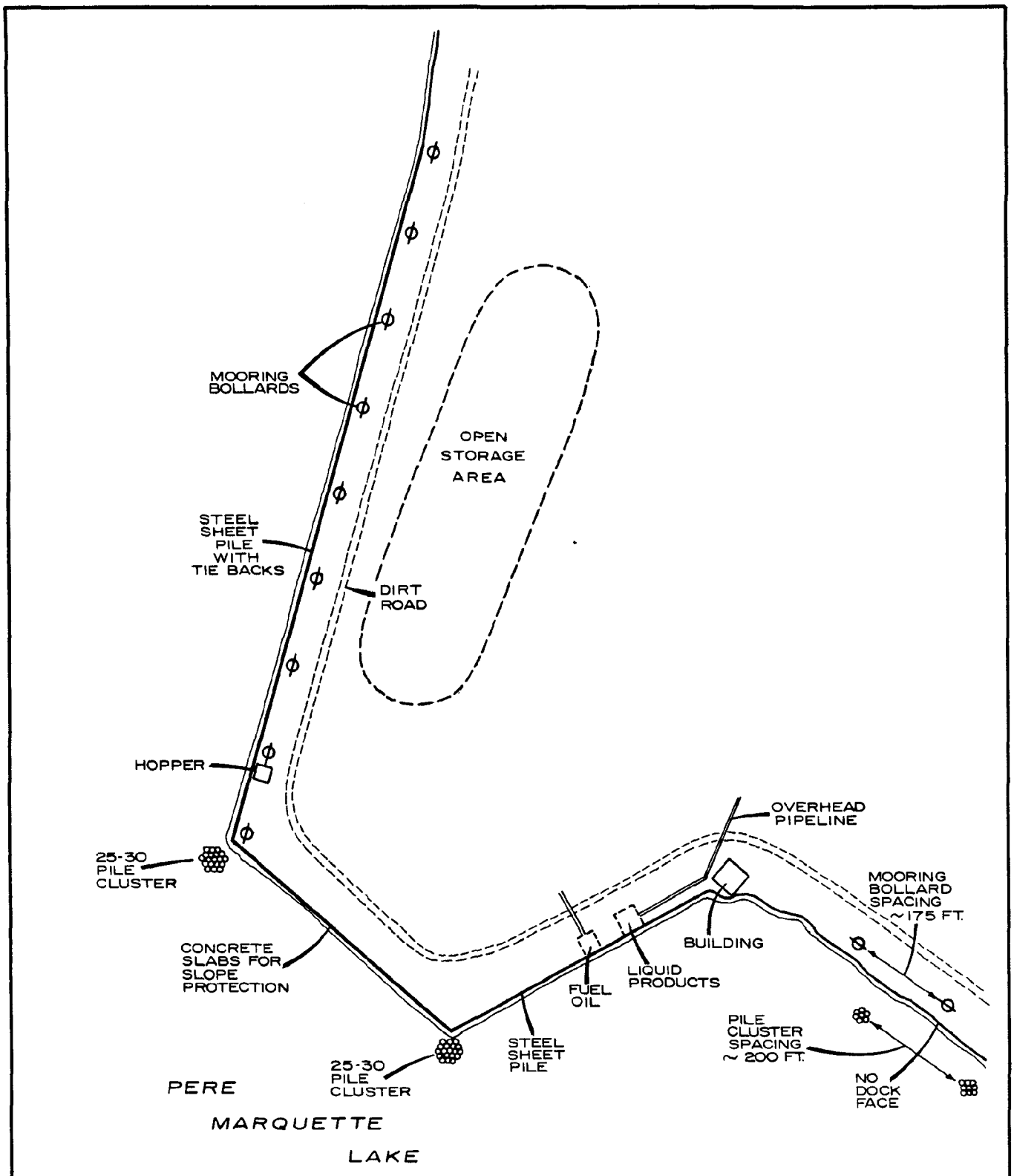
2. The Dow Chemical Company

The Dow Chemical Company Ludington Plant was built during the war in the 1940's and produced magnesium. It was later converted to a commercial lime plant. Figure 23 shows the site plan of the Dow Chemical docking facilities. Liquid product transfer takes place on the east dock face, while dry bulk materials (primarily limestone) are unloaded on the west dock face.

a. Area East of the East Dock Face

The shoreline east of the east dock face was formerly used for mooring barges and loading bulk products through a conveyor system. This dock area no longer serves a functional purpose. The shoreline consists of rock and slag on a 1:1 slope. Mooring pile clusters, 20 feet from the shore, are spaced approximately 200 feet apart. These pile clusters consist of approximately 15 untreated wood pilings wrapped with steel cable. Steel mooring bollards are spaced approximately 175 feet apart along the shoreline.

The mooring pile clusters were installed 10 to 15 years ago and are in fair condition, with some visible signs of decay. The steel mooring



LUDINGTON
PORT DEVELOPMENT STUDY
Figure 23
DOW CHEMICAL CO.
SITE PLAN

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MARCH, 1982 NO SCALE 87029

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bollards are in excellent condition. Figure 24 is a photo taken from this area facing west. In the foreground is the bulk material loading equipment which is presently inoperative.

b. East Dock Face

The east dock is the area where bulk liquid products are loaded and unloaded from barges. The date of construction of this dock is not known. The dock consists of steel sheet pile with two rows of horizontally placed untreated wood whalers bolted to the sheet pile.

The general condition of the steel sheet pile is good. The timber whalers along this dock are in fair condition, with some impact damage which may necessitate repair.

c. Area Between East and West Dock Face

This area is undeveloped for docking purposes. The slope has been protected with salvaged concrete road slabs placed side by side. Two 25-30 pile clusters are located at the ends of this area.

d. West Dock Face

The west dock face is used by self-unloading vessels which tie to mooring bollards along the dock face and unload limestone to a bulk storage area. Harbison-Walker leases a part of this dock for product export.

The dock face consists of steel sheet pile protected by a double row of treated timber whalers. This sheet pile has tiebacks and is in good condition. A one-inch diameter pipe railing is attached to the top of the sheet pile.

3. Mohawk Transportation

a. Facilities and Conditions

The Mohawk Transportation docking facility site plan is shown in Figure 25. The site is located along the channel on the east side of Pere Marquette Lake. Current use of the facility is by shallow draft barges which self-unload and stockpile limestone on the site.

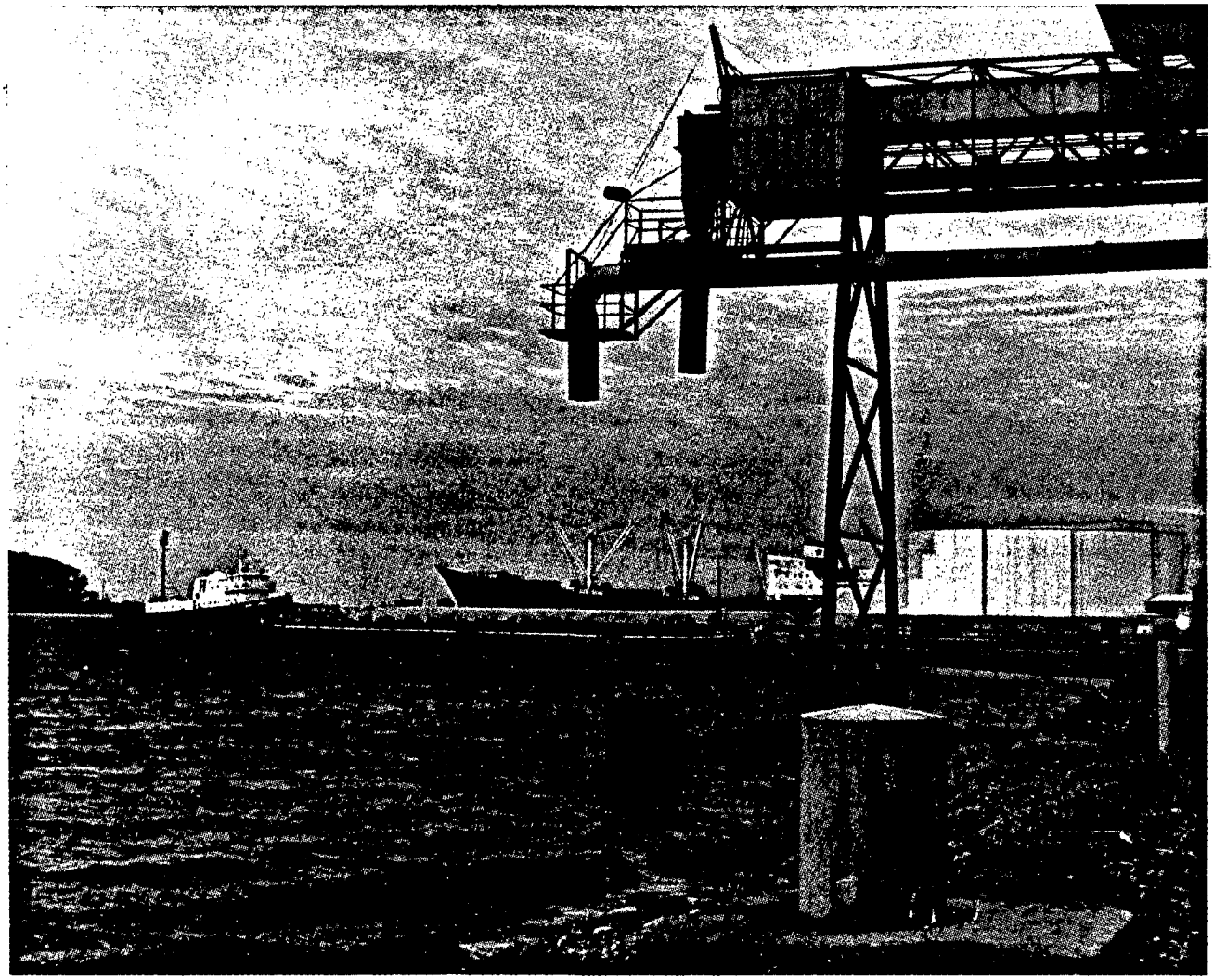
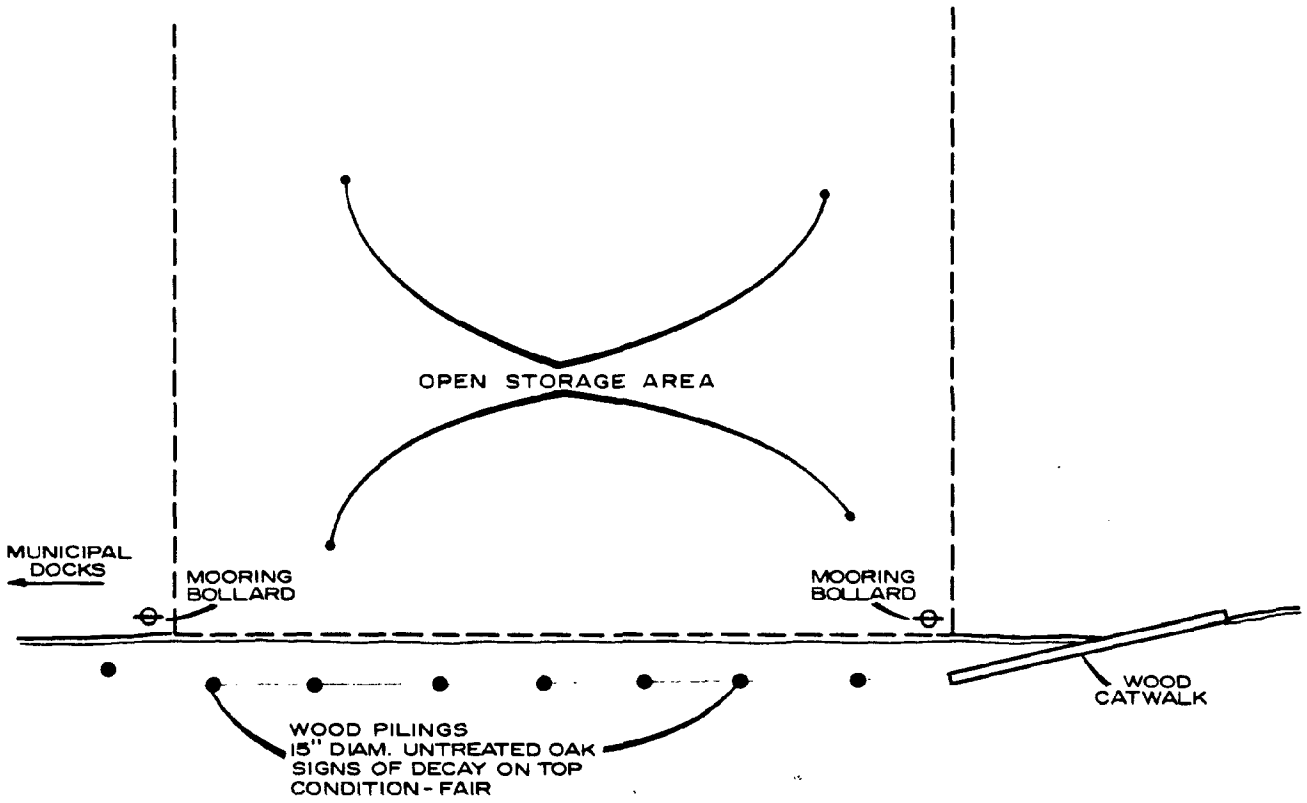


Figure 24
PHOTO FROM EAST OF
EAST DOCK AT
DOW CHEMICAL CO.

CITY OF LUDINGTON
PORT DEVELOPMENT STUDY



PERE MARQUETTE LAKE - CHANNEL

LUDINGTON
PORT DEVELOPMENT STUDY
Figure 25

MOHAWK TRANSPORTATION
SITE PLAN

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MARCH, 1982 NO SCALE 87029

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Figure 26 is a photo of the facility, taken from the west. The facility consists of timber piling near the shoreline, mooring bollards, a bulk material storage area, and an elevated wood walkway along the shoreline. The timber piling, while providing shoreline protection, is basically nonfunctional, since barges remain in the center of the channel moored to bollards on either side of the channel.

The wood pilings are untreated oak, with a diameter of approximately 15 inches and an approximate age of 10 years. Spacing of the piles is 20 to 25 feet. The one mooring bollard on the Mohawk site is a 12-inch diameter, concrete-filled iron pipe. A second mooring bollard, located on the municipal dock site, consists of a 24-inch concrete-filled steel pipe. The wood walkway along the shoreline is also untreated wood and is about 50 feet in length.

The condition of the piling along the shoreline is fair. All of the piling show decay of the outer edge and across the top of the piling. Condition of both mooring bollards is good, with no visible signs of displacement. The wood walkway is in fair condition.

b. Functional Viability

The Mohawk terminal has minimum docking and material handling facilities. The space is extremely limited and there is no room for expansion without razing some existing buildings. This site has poor road/highway access.

The use of this facility is limited to barges due to channel depth, width, and configuration. When the barges use this facility, they tie off to both sides of the channel and block it for use by recreational boaters.

4. Western Concrete Products

a. Facilities and Conditions

The Western Concrete Products facilities are located across the channel from the Mohawk terminal. Figure 27 shows the site plan of this terminal.

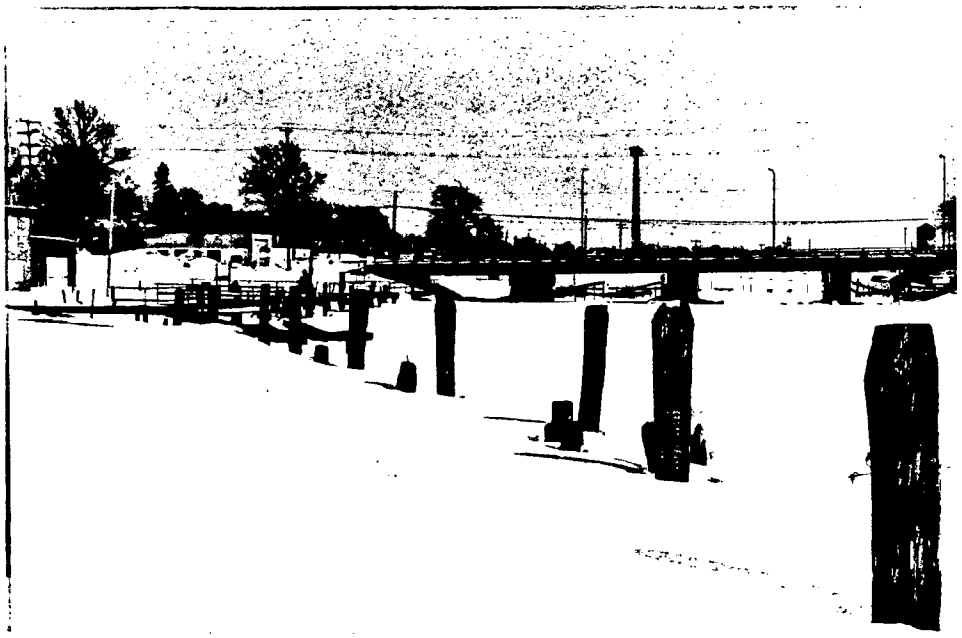
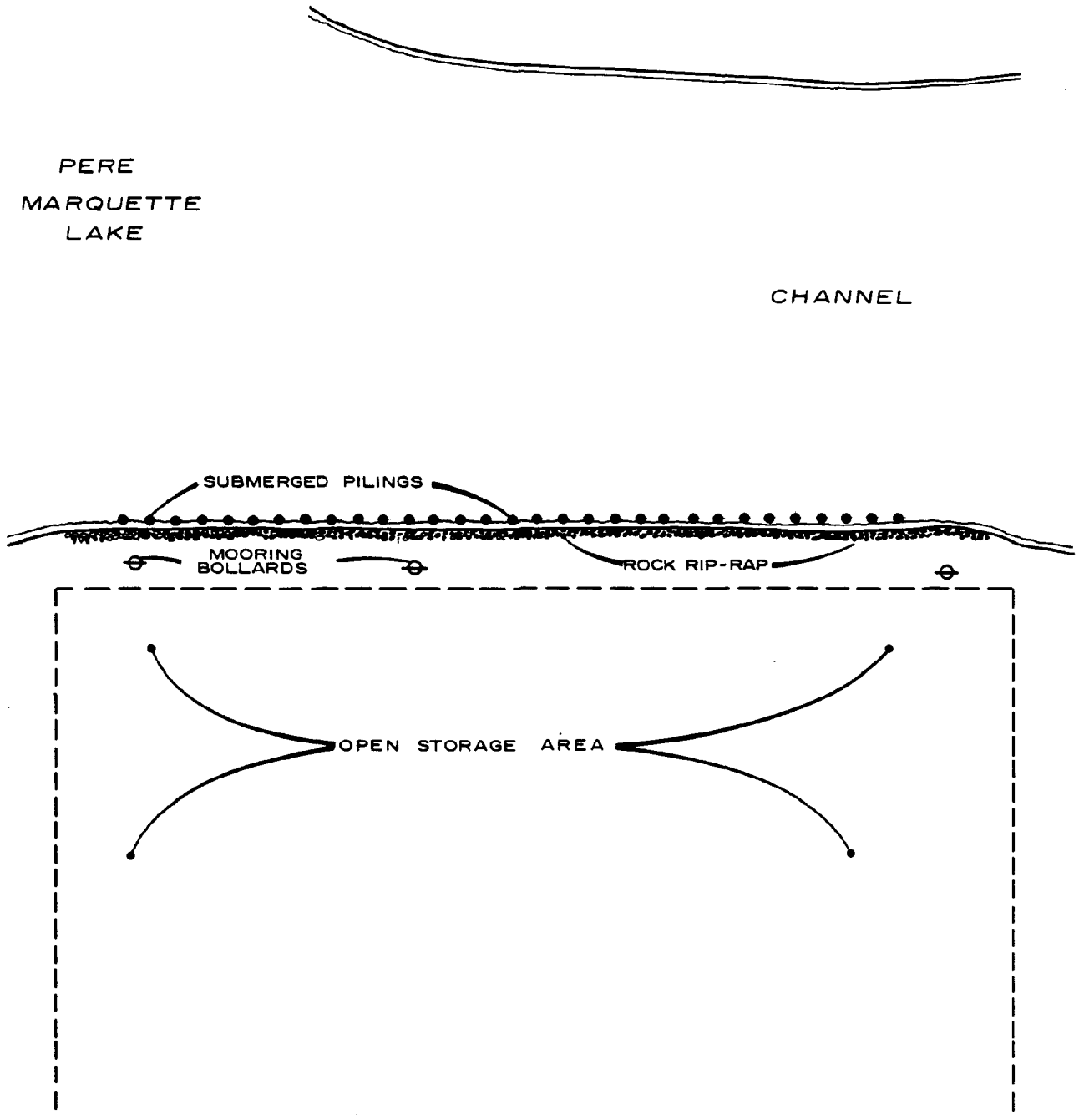


Figure 26

MOHAWK TRANSPORTATION
EXISTING PILINGS

CITY OF LUDINGTON
PORT DEVELOPMENT STUDY



LUDINGTON
PORT DEVELOPMENT STUDY
Figure 27
WESTERN CONCRETE
PRODUCTS
SITE PLAN
N
MARCH, 1982 NO SCALE 87029

WILLIAMS & WORKS

The piling was installed over 20 years ago and consists of untreated timber piling, 6 to 14 inches in diameter. Excessive decay has rendered the piling useless.

The facilities are not in current use. Past usage involved self-unloading, low-draft barges that tied to concrete piling or mooring bollards on either side of the channel. The condition of concrete piling and mooring bollards is good. Future usage for other than this type vessel would require extensive reconstruction of the dock facilities and probable deepening of the channel.

b. Functional Viability

The Western Concrete terminal has minimal docking and material handling facilities. There is adequate room for the use of these facilities. However, there is minimal area for expansion. There is poor road/highway access to this site. The navigation facilities (channel depth, width, and configuration) are adequate for current use.

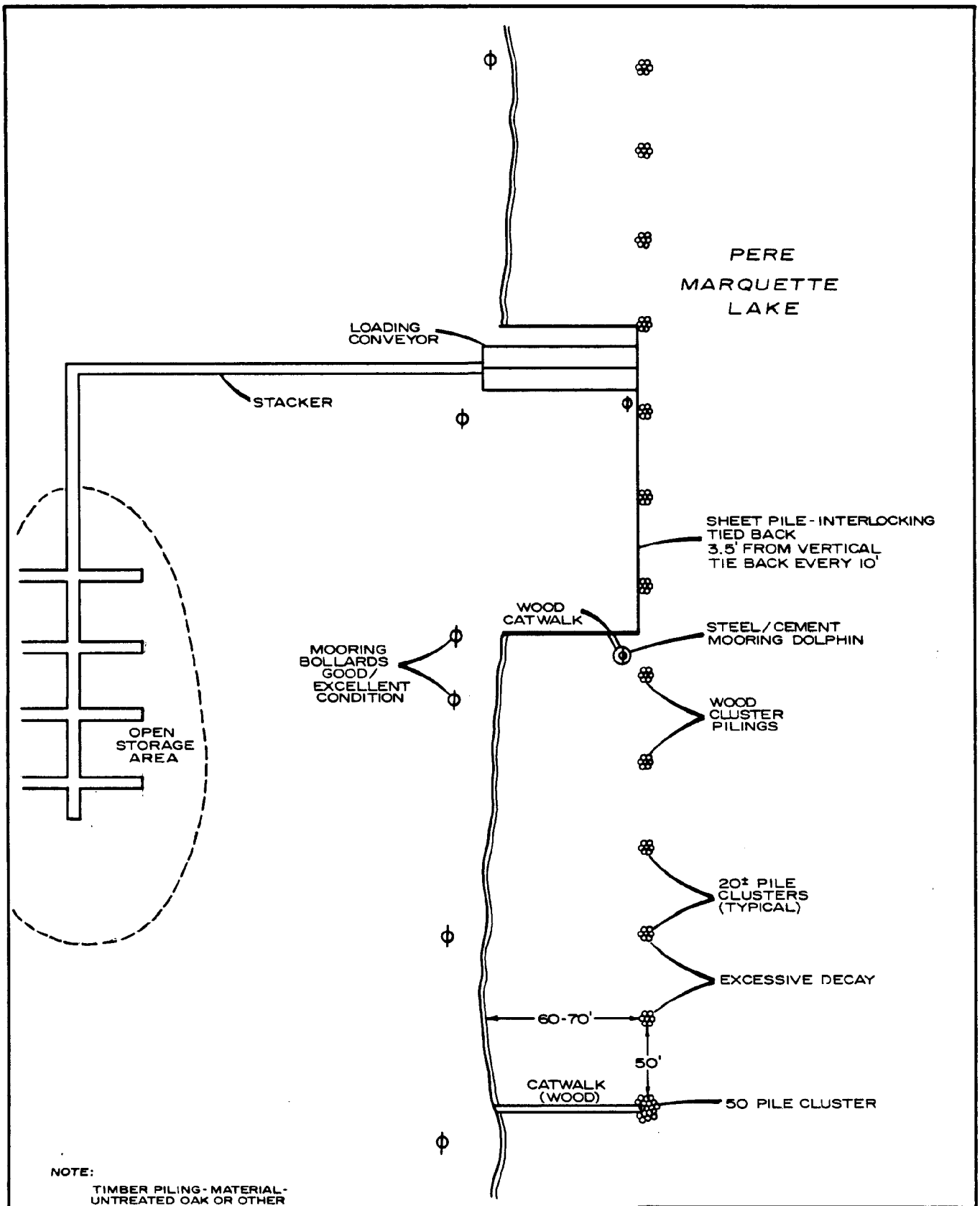
5. Sand Products

The site plan of the Sand Products docking facilities is shown in Figure 28. This dock is located on property leased from The Dow Chemical Company. The dock and bulk loading equipment is used to load sand brought by truck from Hart, Michigan onto vessels bound for Buffalo, New York, or Cleveland.

a. Facilities and Conditions

The dock face is steel sheet pile with a strong tieback system and is in good to excellent condition.

The general condition of mooring clusters is fair. The timber piling for mooring clusters is untreated and some clusters are showing severe decay above the water line. General condition of the clusters in the area of sheet piling is fair to good. The clusters are constructed of 20± piles with wire wrapping 1.0 foot from the top and at the water line.



NOTE:

TIMBER PILING - MATERIAL - UNTREATED OAK OR OTHER HARD WOOD

EXPOSED WOOD SHOWS SIGNS OF DECAY

GENERAL CONDITION - FAIR

LUDINGTON
PORT DEVELOPMENT STUDY
Figure 28

SAND PRODUCTS CO. TERMINAL SITE PLAN

N

MARCH, 1982 NO SCALE 87029

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b. Functional Viability

Sand Products maintains a dock, conveyor loader, and sand stockpile on land leased from Dow. The conveyor is generally in good condition and the dock condition varies from good to poor. There is adequate area for existing operations and limited area for future expansion. The navigation facilities (channel depth, width, and configuration) are considered adequate for current use. This facility is serviced by a private haul road.

Chapter III

Land Use Analysis

CHAPTER III
LAND USE ANALYSIS

INTRODUCTION

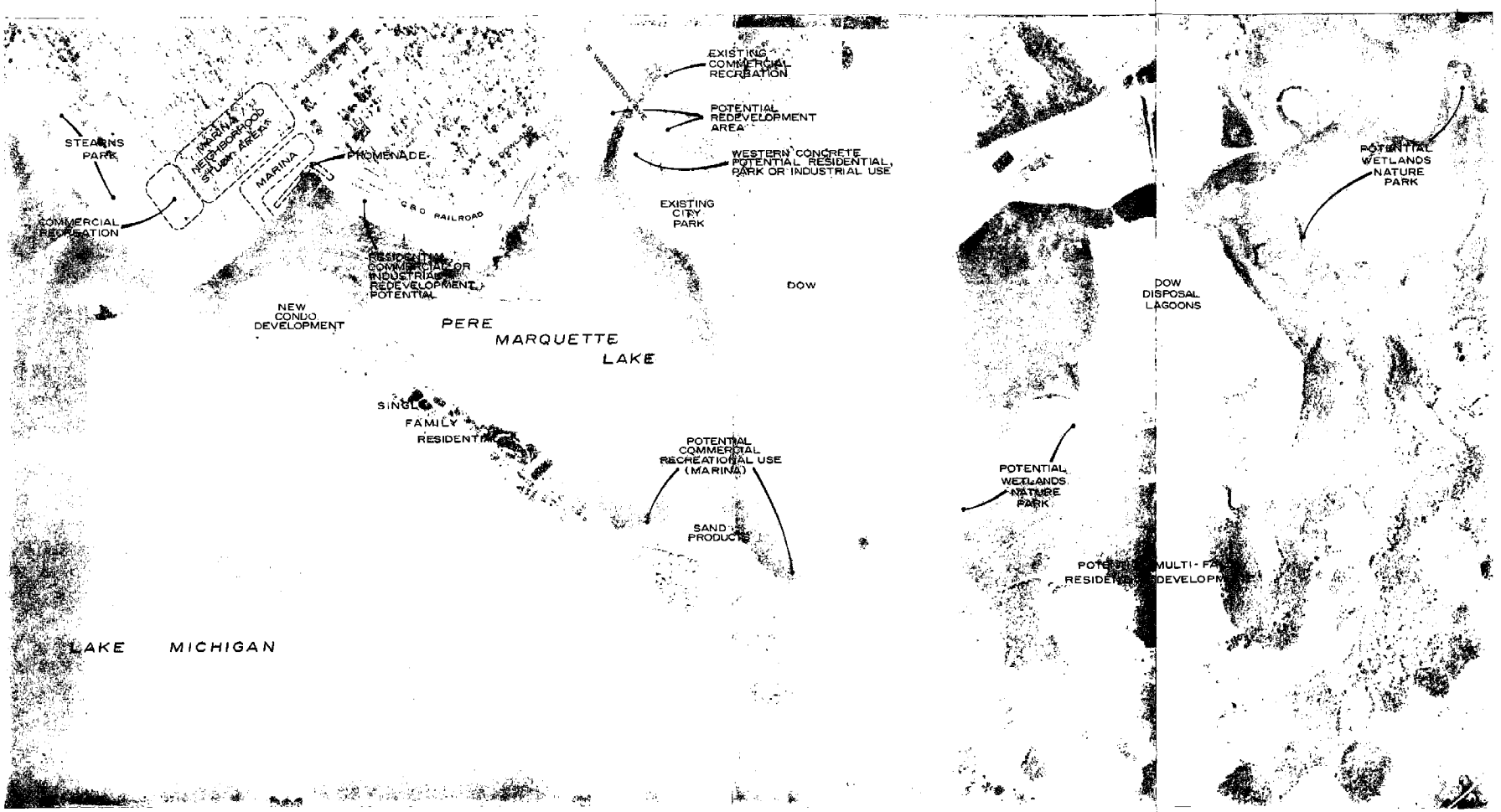
The main focus of this study, port development and its related industrial development, must be balanced with other coastal land uses. The purpose of this section is to analyze the opportunities/limitations for other competing land uses around Pere Marquette Lake. It is focused on underdeveloped and undeveloped areas.

This analysis reports land use opportunities/limitations for remarkable areas, large or small. Thus, not every parcel is discussed, but all areas of the lake are covered. Alternate land use opportunities, as discussed in this chapter, are shown in Figure 29.

A. RESIDENTIAL

Little of the coastal area within the corporate limits of Ludington is residential. There is some residential development, with lake views on the bluff behind the Dow Chemical Plant. There is also some mixed residential development behind the C&O Railroad property. However, this development has neither lake views or access. In the vicinity of the new municipal marina, there is some limited residential development. There is also a new multi-family condominium development at the north end of the Buttersville bar. This development enjoys direct access and views of both Lake Michigan and Pere Marquette Lake. It has maximized this advantage by providing a swimming beach on the Lake Michigan side and private marina facilities on the Pere Marquette Lake side.

Although residential development along the Ludington coastal areas of the Pere Marquette Lake is limited, the opportunities are not. An abandonment of the C&O Railroad facility would open many acres of waterfront property to development. The cost of removing the existing improvements, the railroad's general reluctance to sell land, and the cost of building the project would push the



LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN
Figure 29

ALTERNATE LAND USE OPPORTUNITIES

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MARCH, 1982

87029

WILLIAMS & WORKS

cost of this project very high. Other industrial facilities, such as the Star Watch Case plant, may offer similar redevelopment opportunities at a more modest cost. The Western Concrete Products area also could be developed for residential use.

The mixed use areas along South Washington Avenue and East Dowland Street have limited coastal residential redevelopment opportunities due to the fragmented ownership and limited water access/views.

In contrast to the City of Ludington, the Pere Marquette Township coastal areas have large open spaces. The area along the South Shore, between the Sand Products dock and the Dow disposal lagoons, is generally undeveloped. This area is characterized by steep slopes and a wetlands shoreline. Most of this area is owned by Dow and is zoned Harbor Industrial. It could be developed for multi-family (condominium), residential use if utilities are available to support it.

The existing residential areas on the Buttersville Bar will continue to infill with the development of now vacant lots. Due to the pattern of development and the fragmentation of ownership, no significant amount of multi-family development is anticipated.

B. COMMERCIAL

Commercial as used in this section refers to Commercial Recreational. Neighborhood Commercial and General Commercial is not considered in this section. Commercial Recreational includes all uses which are related to water uses or tourism. Examples of this include motels/hotels, marinas, charter fishing service, restaurants, etc.

Within Ludington, there are a number of established commercial recreational areas. One is along West Ludington Avenue near the beach. As the new City Marina grows in popularity, the pressures on this area to grow in size will increase. The City has recently completed a plan for the area around the new marina. It calls for a mix of commercial and residential and a variety of streetscape improvements. Currently, the new municipal marina is at capacity and there is a demonstrated need for additional marina berths. The current trends of increasing tourism in the area will further add to this need.

The small channel, over which South Washington Avenue passes, supports several marinas and charter fishing services. At present, there is little room for expansion. However, there are a number of abandoned or under-utilized industrial structures in this area that could be recycled for commercial recreational use. A need for a large boat lift and boat repair facility has been identified.

The Pere Marquette Township coastal area has no existing commercial recreational land uses. Some marina facilities could be developed on either side of the Sand Products facility.

C. PUBLIC FACILITIES

The City of Ludington has several waterfront facilities, including the Lake Michigan beach/boat ramp, the new marina, the City dock, and the City Park (south of Western Concrete). Each of these facilities provides some waterfront contact. However, an integrated Pere Marquette waterfront park system is lacking. A promenade along the waterfront by the City Marina would be an attractive spot to watch boating and shipping activities.

There is also an opportunity to expand the City Park (between Dow and Western Concrete) into the Western Concrete area. This would about double its land area and would permit it to be developed into a major park facility, thus providing the impetus for neighborhood redevelopment and giving some relief to Stearns Park. Such a facility could include boat rentals (private concession), food service (private concession), picnic areas, concerts, art/antique shows, and transient boat moorings.

Pere Marquette Township has a park with Lake Michigan frontage. This facility probably serves the Township's current needs. If, however, there is significant residential development along the Pere Marquette Lake waterfront, then some land should be reserved for park usage.

The wetland areas would make an excellent nature study area. A park, developed with boardwalks through the wetlands and offering guided nature tours, could be a regional attraction. Currently, Pere Marquette Township is endeavoring to develop this type of park in the wetlands.

D. CONCLUSIONS

Opportunities for all types of land use exist around the Pere Marquette Lake. Often, several opportunities exist for a single piece of property. Furthermore, certain key properties can greatly influence a neighborhood's character or reinforce existing land use patterns.

The opportunities discussed in this chapter must be integrated into an overall plan and balanced with industrial/port development.

Chapter IV
Economic Analysis

CHAPTER IV
ECONOMIC ANALYSIS

INTRODUCTION

The purpose of this chapter is to analyze and interpret economic base data and influences. This chapter covers a commodity flow analysis, based upon both the existing, published sources and the commodity survey prepared as part of this project. This chapter also includes an economic analysis of the harbor of the City of Ludington and the Ludington area. As a basis for determining future opportunities and limitations, an analysis of general national economic trends for specific commodity groups is provided.

A. GENERAL ECONOMIC ANALYSIS

1. Economic Base

a. The Harbor

The basic economic purpose of the Ludington Harbor is twofold - commercial recreation and commercial shipping. As a commercial recreation facility, it supports various marinas, boat yards, and charter fishing services. It also provides an attraction for fishermen and sightseers who, in turn, purchase goods and services in the Ludington area. Although it is not possible to quantify the contribution of Pere Marquette Lake to the local economy, it is an important element to the local and regional economy.

Commercial shipping usage of the harbor makes possible such facilities as the Dow plant, Harbison-Walker, and the C&O car ferry. It reinforces operations such as Mohawk Products, Western Concrete, Laman Asphalt, and Sand Products. In the past, it supported a commercial fishing industry.

The harbor has the fiscal and economic potential to support other similar industrial/transportation uses/facilities.

b. Ludington

The City of Ludington grew from the lumber industry of the last century. As this industry declined, the city diversified its industrial base. The city has a variety of industries, the largest of which is the Dow Chemical plant which was located here in the 1940's. The Dow facility has had a strong positive economic influence on the community. It is responsible for the attraction of the Harbison-Walker plant, which converts a Dow by-product into a saleable commodity.

At present, the city is home to a wide variety of small and medium industries. This industrial base has cushioned Ludington from some of the recent economic declines; however, some national trends are starting to take their toll on Ludington industries.

Ludington, as the county seat, supports a variety of service firms. Ludington is also the wholesale/retail center for the area.

c. The Area

Ludington is the industrial and employment center for Mason County and the region. Nevertheless, Mason County and the region support several important industries - tourism, agriculture, and natural resource extraction.

The second home market and tourism market has enjoyed marked success in Mason County and the region. Many smaller farms have been converted to vacation developments.

Land in agriculture has been declining, and presently about one third of Mason County is devoted to agriculture. Total agricultural production has been increasing. This has maintained agriculture as an important economic element in Mason County and the region.

Mason County ranks seventh in natural resource extraction within the State of Michigan. It ranks second in natural saline production and fourth in industrial casting sand production.

2. Local Economic Growth Estimates

Local overall economic development estimates are not available. However, growth is anticipated in several economic sectors. Even with a negative population growth rate, Ludington can contribute to the area's economic growth.

- o Ludington has a finite and limited supply of residential land. Thus, its population will stabilize based on available residential area.
- o Ludington's population will fluctuate in relation to the average number of people in a household.
- o Ludington's population will also vary as the density of housing in residential areas changes.
- o As Ludington's industrial and commercial base (both water related and non-water related) expands, residential areas may be lost and their population displaced to elsewhere in the county.

Economic growth in Mason County and Ludington can be broken into several groups for purposes of analysis.

Agriculture. Agricultural production in Mason County is increasing and is forecast to continue. Since the amount of farm land has been decreasing, increased agricultural production can be attributed to improved farming practices, better farming methods, increased mechanization, improved seed stock, and improved/increased use of fertilizers/pesticides.

Manufacturing. The forecast for local manufacturing is poor. Manufacturing has been decreasing in Mason County. Small and medium sized industries do not depend upon harbor availability, but may depend on rail service. Forecastable growth/decline is more directly related to these industries than to large basic manufacturing facilities which need waterborne commerce. The attraction of these basic manufacturers must be considered on an individual basis. They are not statistically forecastable in an economic unit the size of Ludington.

Recreation/Tourism. Recreation and tourism in Ludington and Mason County has been increasing and is forecast to continue. The continued development and improvement of recreation and tourism facilities will contribute to this increase. Likewise, the extension of the tourism season into the winter months will contribute to the increase.

Construction. The construction industry in Ludington and Mason County is driven by general economic expansion and the second home market. Currently, these economic segments are depressed; however, a significant amount of demand is building up. The long range prospect for the construction industry is good.

Natural Resource Extraction. Several types of natural resources are extracted from Mason County and the area. These include: oil and gas, foundry sand, construction sand and gravel, and brine. Oil and gas exploration and production will vary according to local supply, national demand, and international economics. Foundry sand from the Ludington area is in competition with other sand mining areas along the western shore of Lake Michigan. It is directly related to Michigan dune mining laws and the automotive industry's need for foundry sand. The foreign manufacture of "domestic" automobile engine blocks could reduce the demand for local foundry sand production. Construction sand is available locally to meet local demand. Construction aggregates and gravel are usually imported into the Ludington area.

3. Influences on the Local Economy

a. State and National

Ludington, and especially the car ferry traffic, is economically dependent on the national and state economy. The state economy is in turn dependent on the national economy and particularly the auto industry, although Ludington is less directly tied to the the auto industry than other areas of the state. The national economy, as related to Ludington, is discussed in depth in Part B of this chapter.

b. Capital Supply

Capital is necessary for industrial development, redevelopment, or expansion. It must be available at reasonable rates for local economic growth. Although Ludington cannot control the national capital supply or cost, it can, through municipal loans and bonds, make capital available to industry.

c. Labor Supply

Industry needs a source of labor to staff its facilities. Ludington, however, can only indirectly influence the labor supply. In the recent past, Ludington has had a well-balanced labor supply of blue collar, white collar, farm, and service industry workers. Recent poor economic conditions, with closing factories and rising unemployment, may cause a surplus of certain types of workers and cause others with needed skills to leave the area.

d. Land and Infrastructure

Industry cannot grow without land and supporting infrastructure. Recent state statutes now permit cities to condemn and assemble land for industrial and commercial development. The ability to assemble large tracts of land adjoining existing industrial facilities is an important economic development tool. Likewise, industrial expansion is dependent on supporting infrastructure such as roads, utilities, waste disposal facilities, etc. These are services typically provided by the public sector.

4. Physical Implications

a. Land Available

The industrial areas of Ludington's waterfront are crowded. Expansion area is needed. Some industrial areas are in conflict with residential and commercial land uses.

Non-industrial land uses along the north shore of Pere Marquette Lake are mixed and unconsolidated. In several areas, commercial, residential, and industrial land uses run together. Additional recreation and commercial facilities such as a major waterfront park, a large boat hoist, etc. are needed to enhance and reinforce the recreation/tourist industry.

b. Utilities

Adequate natural gas, water, and sewer are available on the north side of Pere Marquette Lake. Natural gas, water, and sewer are generally unavailable on the south side of Pere Marquette Lake. Electricity and telephone are available to all areas.

c. Transportation

The Ludington downtown waterfront area needs a good over-the-road transportation link. It may be possible to develop a truck route along part of the railroad right-of-way. The completion of the US-31 four-lane through to Ludington is also necessary to provide good truck access to the downstate areas.

Waterborne transportation in Ludington enjoys a year-round cross lake shipping season, a good natural turning basin, good wave protection, and an adequate anchorage area. The harbor entrance is maintained at the full St. Lawrence Seaway depth and provides access to a natural deep harbor. If the Seaway were ever to be deepened, then only the Ludington entrance channel would need dredging. Pere Marquette Lake in most cases would be of sufficient depth, although some dredging would be necessary at individual berths.

Several uses are available for the Western Concrete Products site. The site is well situated for receiving dry bulk and liquid bulk materials. In contrast, the Mohawk Transportation Terminal is too small for a major dry bulk operation. However, with some site development, it could be used as a liquid bulk facility by self-unloading barges.

The structural condition of the C&O Railroad Slips No. 1 and 3 make them unusable at this time. At present, the C&O has one slip in usable condition, plus the general purpose barge dock. Dock No. 2-1/2 presently has a vessel in layup and could be used as a ship's berth.

The Sand Products Terminal appears adequate for present use. Likewise, Dow Chemical indicates that their terminal facilities are adequate for present and anticipated future use.

So long as the cross-lake car ferry continues, Ludington will be served by excellent rail service. Along the north side of the lake, there are rail sidings to several sites. The car ferry and Michigan's network of railroads gives Ludington excellent access to points east and west.

d. Ownership

The major landowners around Pere Marquette Lake are the C&O Railroad and Dow Chemical. Dow Chemical owns most of the land from its facility south and east and along the south side of the lake up to and including the Sand Products facility. The C&O Railroad owns a large tract of land in close proximity to downtown Ludington.

Other areas show a fractured and fragmented ownership pattern. Ownership on the Buttersville Bar is predominantly individual single family. Ownership along parts of the north side of Pere Marquette Lake is fragmented according to its use.

e. Natural Limitations

As noted, Ludington enjoys a year-round navigation season. The ice problems in Pere Marquette Lake and the harbor channel are minimal if ice buildup is kept under control. The ability to use the Port of Ludington year-round is an asset which should not be understated.

Along the north shore of Pere Marquette Lake, there are few large flat areas which are available for development or redevelopment. Among these few are the C&O Railroad site, the industrial area in the vicinity of the Mohawk Transportation terminal, and the Western Concrete Products site.

The eastern end of the lake is characterized by shallow water depths and wetlands. This limits the development potential of this part of the lake.

The topography along the south shore of Pere Marquette Lake is very rugged. The steep slopes and undulating terrain do not make this area suitable for intensive industrial development. However, residential development would be possible in this area if utilities were available.

Except for the wetland areas, soils generally do not constrain development around Pere Marquette Lake. Likewise, geology does not constrain development around Pere Marquette Lake.

5. Cross-Lake Ferry - Implications of Discontinuance

The C&O Railway has filed for abandonment of the Ludington to Kewaunee route. The Ludington to Manitowoc route has already been abandoned.

Cross-lake ferry service has been cut back from its peak of six round trips per day to the present one trip per day. The decline in ferry service was followed by a decline in cross-lake carloads carried. This decline continued through 1978 but was reversed for the year 1979.

Kearny Management Associates, in their final report of June 1980, noted several reasons for the decline in car ferry traffic:

- o Rate structures, especially flag-outs on certain commodities
- o Car supply problems
- o Marketing efforts

Nevertheless, all but one of the scenarios prepared by Kearny forecast a 1985 increase in cross-lake traffic.

Since the car ferry accounts for an estimated 90%+ of the Ludington port traffic, its discontinuance would drop Ludington's importance as a Michigan port. Ludington would have a special purpose port status, serving several specific users.

Discontinuance of the ferry would have a variety of negative effects on the Ludington area. Among these are: a) the loss of a major employer; b) the

potential loss of rail service to Ludington; c) the potential loss of federal harbor improvements or priority status (thus delaying improvements); d) the loss of ferry passengers as area tourists; e) the potential loss of year-round navigation. These are serious adverse effects, especially when weighed against the cross-lake traffic potential for rail service and motor trucks.

The full scope of direct and indirect effects of discontinued ferry service is beyond the scope of this analysis. However, it is evident that discontinuance of ferry service would have a major adverse effect on the local economy.

B. NATIONAL ECONOMIC TRENDS

1. Pulp, Paper, and Converted Paper Products

This sector of the economy is strongly tied to the lumber industry through the construction industry. If interest rates slow down the construction industry, this section will also be hurt.

This industry is historically a solid performer. It is capital-intensive and generally modern. The United States paper industry is cost-competitive worldwide; however, the U.S. imports newsprint and pulp from Canada.

The paper industry is a major water user. Pollution abatement and waste treatment regulations are considered an industry problem.

Long-range growth is predicted to increase at 2.9% per year. Imports are expected to decline by about 4% due to increased plant capacity. Exports to Canada, Japan, and many western European countries will decline due to recessionary trends in these countries. Little growth in plant capacity is anticipated before 1985; therefore, operations are anticipated to continue at close to 100% of capacity.

2. Energy

In general, energy usage is related to general economic activity. Utilities have been tending to convert from oil to gas to coal.

There seems to be some future in the production of gasohol based on coal-fired fermentation process. Biomass inputs for this process include: grains and starches, food processing by-products, wood chips, solid waste, and other sources of cellulose.

3. Cement

Canada is the major supplier of cement to the United States. Continued growth is expected, but this depends upon the construction industry. Local shortages may exist through 1985 in certain geographical areas.

4. Lumber

Exports to Japan and Europe are expected to continue at a high level. Canada, the United States' second largest market for export, is anticipated to increase by 10% through 1985.

5. Agricultural Chemicals

In general, agricultural chemicals fall into two groups - fertilizers and pesticides. Fertilizers are based upon a mixture of nitrogen, phosphates, and potash. Nitrogen, in particular, must be renewed yearly. Research is presently underway to find a cost-effective vehicle to hold nitrogen in the soil. Likewise, new technology is being developed to extract potash from low-grade ore.

Nitrogen is forecast to rise in production by 3% per year and in consumption by 4% per year through 1985. World consumption is forecast to increase by 6% per year through 1985. Plant capacity probably will not expand due to the present cost of natural gas and the pricing structure of ammonia. In 1980, the U.S. imported ammonia (as nitrogen) in excess of 700,000 tons. Major exporters of ammonia are Mexico, Canada, and Trinidad-Tobago. Phosphates production considerably exceeded domestic consumption in 1980 due to strong export demand. This situation is forecast to continue through 1985.

The United States imports over 70% of its potash from Canada. Canadian production capacity increases, now in progress, will ease the current tight supply. United States consumption is forecast to increase 2% per year through 1985. World consumption is forecast to increase 5% per year through 1985.

No single or small number of companies account for a major share of pesticide production. Likewise, production is not limited to one or more definable geographic areas.

The industry is mature and little growth is expected; however, due to high domestic consumption and expanding exports, production should remain high through 1985.

Individual pesticide consumption has generally been decreasing due to environmental regulations and integrated pest management programs.

6. Mining

Long-term domestic production is uncertain, and imports are increasing due to the lack of United States production facilities. Nevertheless, the short-term picture is good. The U.S. is a net exporter of non-metallic minerals and has just recently become a net exporter of metal ores and concentrates.

In recent past years, about 25% of available capital has been put into making existing facilities comply with environmental regulations. There is now a need for production modernization which is being frustrated by the lack of capital. Several "cash rich" oil companies have taken advantage of this situation and become involved in mining operations. They have the cash to make the necessary capital improvements.

Much of the once readily available federal lands are now closed to mining. Currently 42% of the federal lands are closed to mining, 16% are severely restricted, and 10% are moderately restricted. Thus, mining operations on private lands are expected to increase.

7. Primary Metals

Demand for raw materials (mineral and non-metallics) is expected to increase about 2.7% per year through 1985. The primary steel industry is directly related to the general economy, especially durable goods such as the auto industry and the construction industry. Slow growth of about 1% per year is anticipated through 1985. Copper is a volatile and unpredictable primary metal economic component. It is, in part, related to the general economy and federal regulatory actions. It is also related to market speculation and precious metal fluctuations. Consumption is expected to increase about 3% per year through 1985. Changes in the auto industry (especially electric cars) and solar energy systems could increase this growth rate significantly.

AMAX Exploration Inc. has recently identified a major new deposit of copper-nickel. This deposit, known as the Duluth Gabbro Copper-Nickel Deposit, is thought to contain 9.9 million tons of recoverable nickel.

At present, Canada is the world's largest single nickel producer. Canada provided 44% of the U.S. imports in 1980.

Nickel consumption is projected to rise at about 2.9% per year through 1985. The development of an effective battery (e.g. zinc nickel) for the electric auto could substantially increase nickel consumption.

8. Shipbuilding and Repair

In general, there is a surplus of world shipbuilding capacity. Shipbuilding orders are badly needed by shipyards to avoid layoffs and dispersal of skilled work force. The Reagan Administration's military expenditures will provide some relief.

Additions to the dry bulk fleet are a prime source of future commercial ship orders. The U.S. Flag Fleet has only 15 dry-bulk vessels. The Maritime Administration estimates that a 10% market share could be achieved by the year 2000 if existing operating restrictions are dropped. A 10% market share could sustain a 172-ship fleet of various size dry-bulk vessels.

The market for off-shore drilling rigs is booming along the Caribbean, Pacific and Atlantic coasts. If oil and gas exploration is permitted in the Great Lakes, a significant market could open up.

The forecast for shipbuilding of inland vessels is strong. A 24% growth rate through 1990 is projected for inland vessels and barges.

9. Freight Movement

The future of railroad freight traffic, especially unit trains, is solid. Class I railroad freight traffic is projected to increase 2.5% through 1985.

Truck traffic is expected to increase about 3% per year through 1985.

Renewed economic growth and increased coal production are expected to increase inland waterway traffic about 3% per year through 1985.

Economic growth and rising petroleum consumption are expected to result in increased pipeline movement of crude oil and products through 1985. A growth rate of 3% per year is expected. The cost-effectiveness of coal slurry pipelines is now approaching competitiveness with unit trains and bulk movements.

C. SHIPPERS SURVEY

1. Ludington Commodity Flow Survey

Although the Ludington Commodity Flow Survey was distributed to a variety of existing and potential port users (272), a very poor rate of return (11%) has been achieved. Even though the rate of return is too low for use in making projections, the survey results provide some interesting and useful pieces of information:

- The main reason for using Ludington is the total transportation cost; however, there are a wide variety of secondary reasons.
- Imports listed were road salt, wood pulp, newsprint, limestone, and components.

- o Exports listed were iron ore pellets, dead burned magnesite, sand, buckwheat, peas, birdseed, appliances, and frozen fruit.
- o Import origins in the U.S. Midwest and Canada/Mexico were given.
- o Export destinations in the U.S. East, Europe/USSR, and South America were given.

Tabulations of the surveys returned are included in Appendix A.

2. Additional Commodity Flow Information Sources

In addition to the original survey prepared for the Port of Ludington, other sources of commodity flow information exist. The U.S. Coast Guard has been conducting a survey of the origin and destination of ships calling at Ludington. Unfortunately, the Coast Guard information is too general, particularly with respect to commodities carried, for port planning.

The U.S. Maritime Administration, Office of Domestic Assistance, can use U.S. Army Corps of Engineers data for an origin/destination computer run. This would be the best information source, since it reflects actual harbor usage over a number of years. If the computer run is not available, then Corps of Engineers Commodity Flow maps and harbor information can be judgmentally assessed.

D. OPPORTUNITIES AND LIMITATIONS

A variety of opportunities and limitations appear to exist for the Port of Ludington. It is difficult to quantify their magnitude at this time. Opportunities and limitations for the Port of Ludington are discussed on the basis of their local, regional, and inter-regional service areas.

1. Local

Local port development opportunities are centered around the waterborne transportation needs of major facilities, including power plants, major manufacturing facilities, or fabricators of large/heavy components. Each of these uses

would require industrial development encouragements to locate in Ludington. These facilities also have large land requirements. Sufficient land would have to be made available through condemnation or conventional assemblage programs.

A second alternative is to attract an industry which only needs a small waterfront terminal for a manufacturing/processing facility which is located off the waterfront. In order to avoid unnecessary drayage fees, this opportunity is limited to industries moving liquid products through pipelines.

A third alternative is to attract a sufficient number of medium sized industries, with occasional waterborne transportation needs. These industries could contract for, or lease, facilities at a general purpose public terminal.

2. Regional

The best opportunities for port facilities which service regional needs is in the delivery of dry bulk construction aggregates and liquid bulk petroleum products (gasoline, heating oil, diesel fuel), and liquid bulk agricultural chemicals (fertilizers and pesticides). As with any bulk operation, the environmental impacts of operation would have to be carefully controlled.

A limited potential for imports and exports of other construction materials (especially lumber) and durable goods exist. This potential should be considered as supplemental to other similar port uses.

3. Inter-Regional

As the Kearny study indicates, there is a good potential for consolidated cross-lake railroad car ferry traffic. It would also seem that there is a good potential for cross-lake motor truck or container traffic.

With a competitive rate structure, it could be possible to offer Ludington as an alternate route for Western coal or pulp and basic paper products. Likewise, it may be possible to offer an Escanaba-Ludington route for winter shipping of iron ore from the Upper Peninsula area.

Chapter V

Feasibility Determination

CHAPTER V
FEASIBILITY DETERMINATION

INTRODUCTION

The information and analyses which are necessary to determine the feasibility of port expansion are evaluated in this chapter. Commodity flow data and conclusions presented previously in combination with these additional analyses provide the basis for determining the level of port expansion which may realistically be accommodated in Ludington.

SCOPE

The scope of this analysis encompasses an investigation of potential development related to commodity flows on the local, regional and inter-regional levels. This is accomplished by taking a close look at several selected development scenarios. The selections made were based on the economic analysis and input from the Harbor Commission and are not intended to be exclusive of other real or potential development opportunities. These scenarios were chosen as representative of typical industries with a good future outlook, or those showing future technological developments.

KEY ISSUES

The key issues of this investigation can be associated with the local, regional and inter-regional levels of commodity flow patterns. On the local level, various types of industrial/manufacturing facilities which could be constructed and operated in Ludington were compared with similar developments in other cities. A regional terminal operation involving shipping and warehousing was investigated in terms of both feasibility to develop and feasibility to operate. On the inter-regional level, the cost of shipping railroad, motor truck, and containerized freight through Ludington is compared to the cost of shipping on competitive alternate routes.

A. PERSPECTIVE ON FEASIBILITY

1. Industrial Location Theory

Industrial location theory has been employed for the purposes of this study to provide an organized framework for the investigation of potential development in the Ludington area. A primary feature of this theory is the pattern of product distribution to the market area. Secondly, the relationship to regional elements, such as the transportation of raw materials and provision of a power source, is important. Thirdly, inter-regional elements affect the locational outlook in a more comprehensive sense.

Natural elements of a particular region, such as the location and availability of raw materials and energy, land surface characteristics, and climate have a definite bearing on its attractiveness to potential industry. Cultural features are somewhat flexible, will influence, and are themselves affected by the location of a new industrial facility. Among the cultural elements to be considered are the labor supply, markets, transportation facilities, subsidies and government regulations.

In order to qualitatively evaluate the many important factors involved in this study of industrial location, they are expressed in terms of costs. The study of these costs is most important, since manufacturing ceases to operate or fails to establish in a region when costs become too high. These cost differentials are examined in one of two ways, depending on which is most appropriate:

1. Comparison of development and production costs between competitive locations; or

2. Evaluation of the feasibility to develop and operate a facility in terms of profitability.

Information on the detailed approach taken to evaluate the various development scenarios is contained in the methodology discussion.

2. Traffic Management - Shipping Operations

a. Functions of Traffic Management

Traffic management encompasses all phases in the control of goods in transit. It involves the arrangement for carriers to move goods, arrangement for temporary storage or warehousing if necessary, the preparation of goods for shipment, and the receipt of incoming shipments. Traffic management also involves establishing the rates and charges for the above services.

Traffic management serves an important role in plant location decisions, whether they be regarding new plant facilities, warehousing facilities, or development of a new product line at existing facilities. Transportation management and costs are inseperable from industrial location theory. The analyses of transportation routes and facilities themselves, under varying commodity flow patterns, are a vital step in the industrial location analysis.

b. Major Shipping Operations

The water borne shipping business is highly competitive and its operations are complex. The principles of industrial sales management apply to the promotional work of the shipper's services. Booking space on a carrier involves ascertaining when that space will be available within the desired time limits, and obtaining the necessary freight contract and shipping permits. Other paperwork must be coordinated, which is generally referred to as shipper's papers. It includes the bills of lading, freight bills, dock receipts, and delivery receipts.

The operation and management of terminal facilities is another facet of the shipping business, although the terminal may be operated by other public or private concerns. Stevedoring is an essential auxiliary operation which has to do with the actual handling of cargo between the terminal and the hold of the ship. The physical operation of the carrier itself involves purchasing fuel and ship stores, arranging for maintenance and repairs, scheduling, purchasing insurance, and staffing the ship, among many other things.

B. METHODOLOGY

1. Criteria for Defining Case Parameters

In order to approach the question of economic feasibility from a least cost or profitability viewpoint, the criteria for defining variables was chosen to simplify the complex study of industrial location and transportation costs. These criteria are also helpful in understanding the relationships between transportation cost and locational factors, marketing area breadth, and regional or community development trends.

a. Local Plant Development

Plant development costs are expressed in terms of a cost per unit of finished product. This cost is the sum of production costs, transportation costs for raw materials from their sources, and transportation costs for finished goods to their various markets. Raw materials were assumed available from the closest sources. Market areas were established based on characteristics of each particular industry. Production costs are often based on economies of scale; thus, the size of a particular facility plays an important role. An effort was made to obtain production costs based on modern, typically sized facilities that are appropriate for the particular market they serve.

b. Regional Shipping Terminal Development

The cost of developing and operating a regional shipping terminal is the sum of shipping costs to and from the terminal and operating costs, including storage or warehousing costs. For the various commodities investigated, warehousing, handling and shipping costs were developed appropriate to the commodity. Where a trade-off between holding costs and transportation costs exists, an attempt was made to reach an optimum balance which reduces total distribution costs. For example, when substantial costs are involved in holding inventories, it is possible to substitute a higher-priced, but faster means, of transportation.

c. Inter-Regional Shipping Operations

In the development of inter-regional shipping costs, the total shipping, transfer, and terminal charges were compared for a commodity traveling on various routes. Railroad routes were identified between urban centers which follow natural traffic patterns and minimize switching and transfer operations. Motor truck routes were based on the shortest and most direct route.

2. Data Sources

A complete listing of references and sources of data for the feasibility determination are contained in Appendix B. Published references on transportation and location theory were largely utilized to establish the equations, define the variables involved, and make the necessary simplifying assumptions. Transportation and material cost quotes were obtained from various sources, as necessary, to supplement and update published cost data.

3. Judgments

Many simplifying assumptions were made in order to provide an understandable and workable system for analyzing the cost data. Explanation of the principal assumptions made for each case studied are explained in the section containing the results.

4. Equations

a. Local Plant Development

The equation used in the cost comparison for local plant development is as follows:

Is (total cost) for Ludington less than (total cost) for other locations?

Where total cost is defined as:

Total cost = T raw + T fin + MFG

- T raw = Total cost of transporting raw materials to the plant site by appropriate means
- T fin = Total cost of transporting products to the market area by appropriate means
- MFG = Total cost of manufacturing, including facility construction costs, labor costs, energy costs, taxes, etc.

b. Regional Terminal

The equation used for determining the feasibility to operate a regional shipping terminal is:

Are (total terminal and shipping costs) for Ludington less than (total terminal and shipping costs) for other locations?

Where total terminal and shipping costs include:

(total terminal and shipping costs) = S_d + T fee + S dest

Where:

- S_d = Total shipping costs to deliver commodity to the terminal
- T^d_{fee} = Total terminal fees, including transfers and surcharges
- S dest = Total shipping costs to deliver commodity to its destination

The equation used to assess the feasibility to develop a regional shipping terminal is:

(cost to develop the terminal) + (terminal operating expenses) is compared to (volume) x (revenue rate)

Where the cost to develop and operate the terminal is compared to the revenues collected.

Where:

- Cost to develop = Construction cost (including engineering) + Financing + Land cost + Equipment cost
- Operating Expense = Fixed costs (utilities, taxes, administrative overhead, etc.) + Variable costs (labor, energy, etc.) + Non-productive burden
- Volume = The anticipated amount of tonnage that will be handled
- Rate = The charges for using various services of the terminal (i.e., docking fees, storage fees, transfer fees, etc.)

c. Inter-Regional Shipping

The equation used to evaluate inter-regional shipping operations compares shipping costs through Ludington to shipping costs through other routes, as follows:

Are (total shipping costs) through Ludington less than (total shipping costs) via other routes?

Where total shipping costs include:

Overland transportation costs to Ludington (or other)
Cost to transfer onto vessel
Vessel transportation charges cross-lake
Cost to transfer off vessel
Overland transportation costs to destination
Commodity penalties (if any)
Empty carrier return charges

5. Cases Investigated

The following industrial/manufacturing facilities were investigated regarding feasibility of development in the Ludington area:

Cement manufacturing
Pulp/paper production
Agricultural chemical processing

A limited investigation was made in three additional areas:

Steel fabrication
Ship building and repair
Power generation with wood fuels

The other locations which were used for comparison vary by industry and are given in the section on results.

The feasibility to develop and operate a regional shipping terminal was evaluated for the following commodity groups:

General cargo
Dry bulk material (such as sand, gravel, cement, etc.)
Liquid bulk material (petroleum products, chemicals, fertilizers, etc.)

Operational costs were compared for the following routes:

Cross-lake through Muskegon
Overland through Chicago
Cross-lake through Chicago
Through Mackinaw Straits

Inter-regional traffic was also evaluated for the commodity groups and routes listed above. The analyses were performed for rail freight, motor truck freight, containerized/piggy back cargo, and for passenger travel.

C. RESULTS

1. Local Plant Development

a. Cement Manufacturing

The cement manufacturing industry is characterized by a fairly widespread distribution of raw materials, comparatively low finished product costs, and great bulk materials with consequently high transportation costs involved. Since considerable fuel is used in production and bulky raw materials are involved, cement can be produced profitably only on a large scale.

Cement manufacturing involves mixing and crushing the raw materials, limestone, clay and gypsum, and firing them in kilns to a temperature of about 1500°C. The material from the kilns, called clinker, is crushed into a fine powder to which a variety of additives may be combined to produce the cement.

The ideal location for a cement plant is nearby the raw materials and fuel sources, and fairly centralized with respect to markets. The availability of labor is rarely important in the location of new cement plants, since the industry is highly mechanized. However, labor is an important factor in the cost of production and will influence the choice of location in this manner.

Major U.S. market areas where water borne transportation of cement have developed are along the East Coast, the lower Great Lakes, and the Mississippi River. Where there is a large concentrated market which can be reached by water routes, substantial economies of scale can be achieved in shipping costs. This shipping method requires the use of huge barges, docks, and automatic loading and unloading facilities in order to be economical.

The results of the feasibility analysis for the development of a cement manufacturing plant are presented in Table 13. Since the proximity to market areas and transportation costs play a vital role in the location, the equation for cost comparison was modified to compare the breadth of market area which could feasibly be reached. This modified equation is as follows:

Market cement price = Total production costs + profit

Where the total production costs are:

Total costs = T raw + T fin + MFG, as defined previously.

The average market price of bulk cement, from Engineering News Record's monthly market quotations for January 1982, is $57.23/ton or $2.86/cwt. For the purposes of comparison, a uniform profit of 10% has been assumed. This assumption allows estimation of the feasible market radius by various modes of transportation, presented in Table 13.

As seen in Table 13, Ludington does compare favorably to other locations for the production of cement. In addition to the markets reached directly by rail and truck, market areas across the lake and in Chicago could feasibly be reached by barge.

TABLE 13

COMPARISON OF MARKET AREAS

FOR

CEMENT MANUFACTURING IN SELECTED CITIES

City	Manufacturing Costs (MFG)	Raw Material Transportation Costs, (Traw) (Trucked)	Available Transportation for Finished Cement (Tfin) after 10% Profit	Approximate Market Radius (Miles)	
	- $/CWT -			Motor Truck	Rail
Chicago	1.07	0.78	0.73	100	150
Grand Rapids	1.07	0.78	0.73	100	150
Lansing	0.99	0.58	1.01	250	350
Ludington	1.02	0.54	1.01	250	350
Traverse City	1.00	0.74	0.84	150	200

b. Pulp/Paper Production

Pulp mills process wood and other fiberous materials into pulp through either mechanical or chemical processes, or a combination of both. The principal woods used are spruce, hemlock, southern pine, poplar and fir. Cereal straw such as oats, rye and barley are often pulped for making corrugated box board. Paper mills refine the pulp and add bleaches, dyes, or other additives, depending on the paper stock desired. The pulp is formed into paper through a process of screening, drying, rolling and pressing.

Pulp mills are commonly located near or at the source of wood. Many mills own or lease timberland and produce up to 75% of their raw material requirements. When not integrated with the paper mill, the pulp is rolled into bundles and shipped to the paper mill.

As with the cement industry, pulp and paper mills are highly mechanized and thus not dependent on a large labor force. The major factor in location of pulp and paper mills is proximity to the growing area as the raw materials are bulky and low-valued and will not bear high transportation costs.

The results of the feasibility analysis for a pulp mill alone are presented. For the purposes of comparison, it was assumed that pulpwood was not available locally and would be purchased and transported from Escanaba, Michigan. Markets for the pulp (paper mills) were assumed to be located in five major cities in proportion to their population: Chicago, Grand Rapids, Lansing, Milwaukee, and Madison. Table 14 presents the results of this analysis.

As seen in Table 14, Ludington compares favorably with the other areas. If a pulpwood source could be located nearby to supply a portion of the wood requirement, this would greatly reduce the total manufacturing costs as it would reduce the cost of raw material transportation. If the timberland were owned or leased by the pulp mill, the total manufacturing cost would be further reduced.

TABLE 14

APPROXIMATE COSTS OF TRANSPORTATION AND PRODUCTION OF BLEACHED KRAFT PULP

Plant Location	T Raw	T Fin	Mfg	Total
Chicago	1.54	0.43	20.65	22.62
Grand Rapids	3.24	0.87	20.75	24.86
Ludington	1.22	0.97	19.45	21.64
Milwaukee	1.38	0.65	21.50	23.53
Traverse City	1.20	1.12	19.00	21.32

c. Fertilizer Production

The three main components of commercial fertilizer are nitrogen-phosphorus-potassium (N-P-K). Fertilizer production at Ludington would depend upon the importation of these materials, plus nitric acid, at production levels. Since Canada is a major producer of two of these components - nitrogen (as ammonia) and potash, the Great Lakes Basin has good potential for fertilizer production. It must be noted, however, that this area is in competition with the Gulf Coast (especially Louisiana, Texas and Florida), which have established production facilities. In addition, the Gulf Coast has year-round ocean shipping service for large size vessels. Of course, the cost of transporting the final product from these areas to northern markets would be greater. Likewise, a fertilizer production facility at Ludington could be in competition with existing/potential Canadian facilities.

Production costs for six selected cities are compared in Table 15.

TABLE 15

APPROXIMATE MANUFACTURING COST OF FERTILIZER (13-11-12, Grade)

	Mfg $/cwt*
Chicago	5.40
Detroit	5.57
Grand Rapids	5.42
Ludington	5.18
Milwaukee	5.22
Traverse City	5.09

* Includes the cost of raw material transportation

Since natural gas is the third largest production cost (after raw materials and labor), Ludington's competitiveness could be enhanced if a dependable private source of natural gas were available.

Since there are no local fertilizer production facilities, a Ludington facility must provide fertilizer at a lower wholesale price than other competing wholesalers. A Ludington facility also must have sufficient market demand to absorb its 100,000 tons of annual production.

Total cost delivered to Big Rapids from selected cities is shown in Table 16.

TABLE 16

APPROXIMATE COSTS OF TRANSPORTATION AND PRODUCTION OF FERTILIZER (13-11-12, Grade) ($/ton)

Plant Location	Mfg	T fin	Total
Chicago	107.92	20.70	128.62
Detroit	111.30	21.45	132.75
Grand Rapids	108.35	7.15	115.50
Ludington	103.70	7.80	111.50
Milwaukee	104.33	22.50	126.83
Traverse City	101.80	10.40	112.20

As seen in Table 16, Ludington compares favorably with other areas.

d. Steel Fabrication

Steel fabricating involves the operations of cutting and shaping the steel, and fastening components together. Depending on the item being produced, operations could involve stamping, rolling, cutting, riveting, welding, machining of parts (tool and die), and finishing operations such as painting, plating or corrosion treatment. This type of industry is fairly flexible, producing many specialty items and constantly changing to meet varying product markets. It is capital intensive, as most processes are mechanized and many are computerized. It is also labor dependent, as skilled craftsman, machinists, and equipment operators and repairmen are vital to the industry.

Since the Ludington area would not support a large scale, general fabricator, only a specialty fabricator has been considered. Preliminary investigations revealed that the only significant advantage to a Ludington location is the harbor access for heavy lift ships which handle extra large size components. Even this advantage is limited by the lack of suitable terminal facilities and the limited navigation season of the St. Lawrence Seaway.

e. Ship Building and Repair

Ship building and repair can be considered as having three sub-groups: ocean-going vessels, inland vessels, and private pleasure craft. Each sub-group has been considered.

There is, at present, a world surplus of ship building and repair capacity. Likewise, there is a surplus of Great Lakes ship building and repair capacity for "laker" class vessels. Despite the aged nature of the Great Lakes fleet, these vessels and ones built at existing shipyards will meet Great Lakes demand for the foreseeable future.

The forecast for inland vessels is strong (refer to Chapter IV, Section B, 8); however, these vessels are primarily river tugs and barges. Although such vessels could be built at Ludington, preliminary investigations did not indicate favorable conditions. Ludington does not have direct access to, nor favorable transportation rates for, steel supplies. Steel from Gary, Indiana must be transported up-lake, against it's ultimate market direction. Steel from Europe or Japan is available only during a limited navigation season. In addition, Ludington does not have a ready labor pool of skilled labor for this specialization.

In short, Ludington would be in competition with many other communities on the Mississippi-Ohio-Missouri River system.

Boat building and repair for pleasure craft has its own set of economic variables. The pleasure boat building market is very volatile and highly competitive. It is characterized by a few industry "giants" and many

smaller companies. Survival of these smaller companies depends on fickle consumer acceptance, a sound product, and a competitive price. Boats less than about 15 feet LOA (length over all)can be built almost anywhere and trailered to the retailer. Boats above 25 feet LOA (especially above 35 feet LOA) are usually built on-order at a waterside plant. The industry giants seems to locate production facilities near major boating centers. As a result, delivery costs to the owner are reduced and sales representatives have models to work with. Major yacht building areas are: California, South Florida, Connecticut, and Maryland. Within the Great Lakes, the population centers of Chicago, Detroit, and Cleveland would seem to be logical production centers. It is known that there is are medium and small yacht building companies throughout the Great Lakes; however, it is difficult to justify this location in terms of economic advantage. What seems to be their major attraction is a quality of life that a community offers.

Boat and yacht repair do seem to have some potential; however, the demand is difficult to quantify at this level of analysis.

The demand for facilities, beyond those offered by a competent marina, is related to the number of permanent and transient boats at Ludington. Likewise, the availability of major repair services and out-haul facilities will influence work people to call Ludington home port.

Several local people, familiar with Ludington's facilities, have indicated a need for a large boat out-haul facility. Given the occupancy rate at the new city marina, if the city doesn't need a large boat out-haul now, then it will probably need one soon.

f. Power Generation with Wood Fuels

On November 29, 1977, Governor William G. Milliken's Conference on Wood Energy was held in Ann Arbor, Michigan. The purpose of this conference was to examine the benefits and problems associated with the use of wood for energy. A variety of topics were presented at the conference, including the following:

1. Methods of harvesting wood
2. Forestry management
3. Combustion and power generation technology
4. Requirements of the annual growing stock
5. Cost analysis of power generation with wood vs. other energy sources
6. Efficiency of wood fuels
7. Two case studies where wood has successfully been used for steam heating

The main conclusion of this conference was that wood might feasibly be used as a supplemental and renewable source of energy, particularly if the cost of conventional fuels continued to rise at the rates that had been observed prior to 1977.

Following this conference, a feasibility study was conducted for Consumers Power Company by a consulting engineering firm. The study investigated the potential for a 50-megawatt wood-burning power plant which would be located in Osceola County near Hersey, Michigan. Following the study, a public hearing was held to present the results and obtain public input. Based on the amount of public opinion against the power plant and related environmental concerns which were expressed, the project was terminated. No further investigation into a wood-burning power plant at this or other locations has been undertaken.

2. Regional Distribution

a. General Cargo Terminal

A review of the commodity flow information and survey results did not reveal any significant general commodity movements. This lack of volume makes a general cargo terminal infeasible at any development cost or rate structure.

The lack of a general cargo terminal does not have to leave Ludington without such service. An inland warehouse could be used to make up rail car loads or container loads for transhipment. A freight forwarder, or other agent, knowledgeable in the preparation of marine documents, would also be necessary.

b. Dry Bulk Terminal

Phase I Operations (limited to inert construction aggregates only):

Direct contacts revealed a current dry bulk importation of about 12,000 tons of limestone annually. A limited terminal, utilizing C&O Dock No. 1-1/2, could easily meet this demand. It would also provide the basis for additional terminal growth and open two existing terminal sites on the channel for redevelopment. Information detailing a limited bulk terminal development cost, operating cost, and site layout is included in Chapter VIII, Development Opportunities, Dry Bulk Terminal, Phase I.

Phase II Operations:

Preliminary investigations indicate that the dry bulk terminal operations might feasibly be expanded in Ludington in the future to receive greater incoming shipments. The materials which have the most potential are:

Crushed stone (primarily limestone)
Rock salt (for ice control on roads)
Seal coat chips

Use of an existing terminal to receive shipments of agricultural lime has also been reported. Any materials other than inert aggregates which are considered for shipment through this terminal in the future must be carefully considered with respect to their potential environmental impacts.

The demand for crushed limestone and aggregates varies naturally along with the volume of heavy construction. The use of road salt is somewhat more constant, although quantities are cut back during slow economic periods. A market for the following quantities of materials could be developed for the terminal:

	Annual Demand
Crushed limestone	100,000 tons
Rock salt	5,000 tons
Seal coat chips	5,000 tons

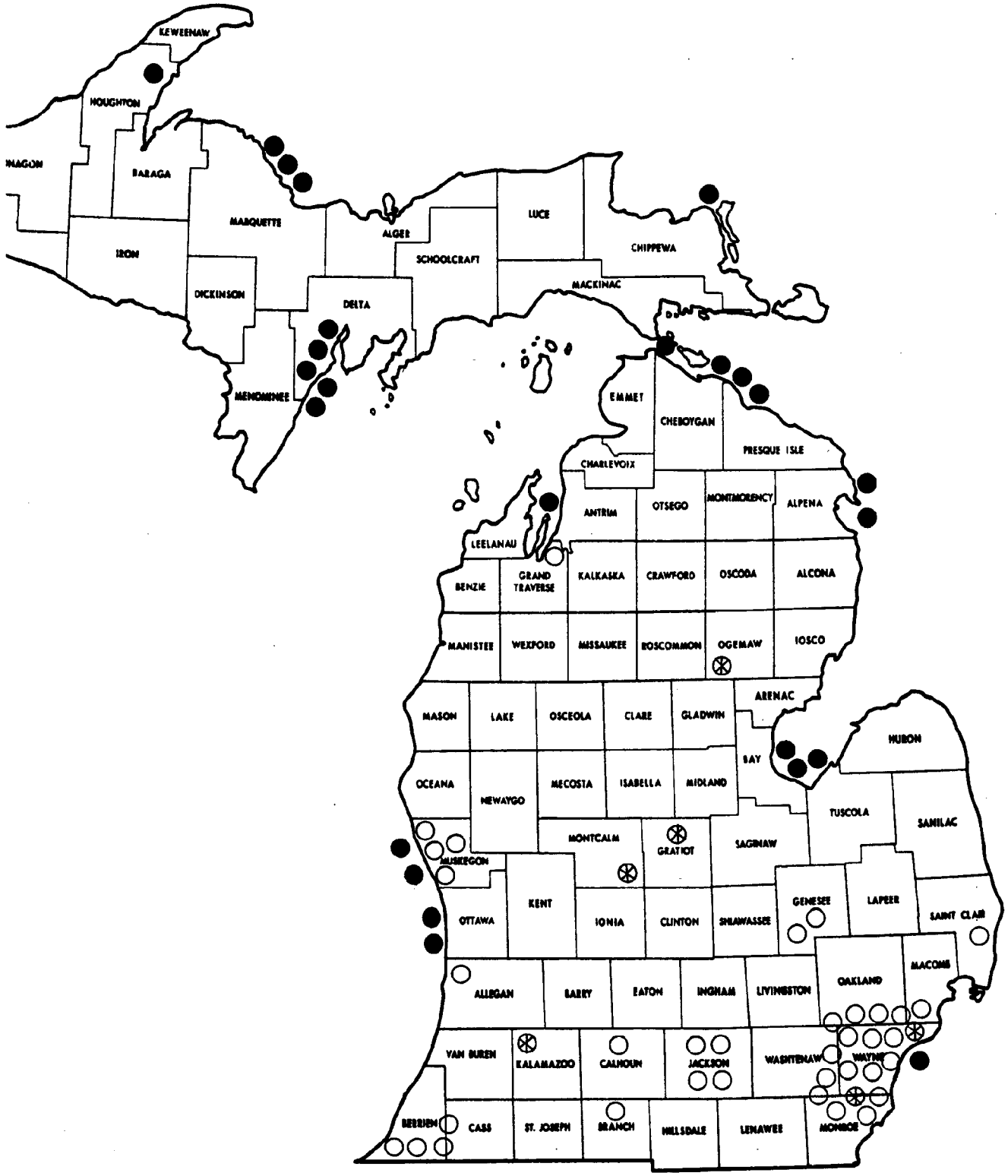
The cost to develop and equip a terminal to receive these materials is approximately $578,000. The terminal would receive shipments which could be loaded directly into rail cars or stockpiled by self-unloading barges. Annual operating costs for this facility are estimated at approximately $237,000, of which $82,000 is retirement of capital debt. Information detailing the development costs and layout for such a terminal is given in Chapter VIII; Development Opportunities, Dry Bulk Material Terminal, Phase II.

The market price for crushed limestone in the Ludington area varies, depending on the quantity and gradation desired. A typical cost for truckload quantities of limestone is approximately $18 per ton. To pay the terminal's annual operating costs and make a 15 percent profit, the terminal charges would be approximately $2.50/ton, or 14% of the market cost of limestone (assuming 110,000 tons annually).

c. Bulk Petroleum Terminal

A bulk petroleum terminal would be the most capital intensive and costly of the various types of bulk terminals investigated. It would most likely be developed in Ludington by an oil company or by a major distributor which has a large enough share of the market to recover its capital investment. The map on the following page shows the location of existing marine and pipeline terminals in Michigan. From the map, it can be seen that there are currently no terminals in the immediate area of Ludington.

The approximate annual consumption of petroleum products in the Ludington hinterlands is as follows:



⊛ REFINERIES
● MARINE TERMINALS
○ PIPELINE TERMINALS

SOURCE: MPA 1980-81 MARKETING DIRECTORY AND YEARBOOK

WILLIAMS & WORKS

LUDINGTON
PORT DEVELOPMENT STUDY
FIGURE 30
MICHIGAN BULK
PETROLEUM TERMINALS

OCTOBER, 1982 87029

Gasoline (all grades) and diesel fuel	1,400,000 barrels
Fuel Oil (#1 and #2)	400,000 barrels

The cost to develop and equip a terminal which could receive and distribute 25% of this annual amount with a two-month storage period is approximately $4.4 million. This terminal would provide a total storage capacity of 96,000 barrels in nine tanks, which could be rotated by product, as demand dictates. This capacity is typical of existing marine terminals in northern Michigan.

Annual operating costs for this facility are approximately $782,000, of which the major portion is the retirement of capital facilities debt. If the annual operating costs and a 10% profit are levied uniformly on the annual volume of bulk products, the terminal fee would be approximately $1.93/barrel, or $0.046 per gallon.

Information detailing the development costs, operating costs, and site layout for such a terminal is given in Chapter VIII, Development Opportunities, Bulk Petroleum Terminal.

3. Inter-Regional

a. Railroad Traffic

Several comprehensive studies of cross-lake railroad car traffic have been made. A. T. Kearny & Associates published a study in 1980 that indicted a possible range of 16,145 to 62,433 carloads annually for Ludington and Frankfort combined. These estimates are based upon six scenarios which test several variables such as rate structure, level of service, and natural growth.

The most recent study: ITB Utilization Plan for Lake Michigan (by John J. McMullen Associates, et al) was prepared for the Michigan Department of Transportation. It was published in draft form in May 1982. The McMullen study estimates 35,000 carloads annually in 1985, based upon a four round trips per day schedule. The demand is estimated at 27,000 carloads

annually in 1985, if only two round trips per day are provided. These estimates do not include empties which would increase total volume by about 50 percent. These estimates are for "upper lake" service; that is, all rail car traffic for Ludington and Frankfort combined.

The McMullen estimates are intended to be conservative and to reflect status-quo conditions. A major factor is the future policy of the C&O Railroad with respect to traffic routing through Chicago, Illinois. A C&O policy to route all traffic through Chicago could lower these estimates by as much as 50 percent.

The McMullen study suggests that 99% of the estimated railroad traffic and all of the passenger/auto traffic can be accommodated by using the intergrated tug barge (ITB) and either the Spartan or the Badger. This combination of vessels results in the lowest cost ($329/carload) but does not accommodate any of the projected truck/trailer traffic.

The McMullen study is based upon a direct survey of railroad cross lake users and analysis of historical trends.

b. Truck, Trailer, Container Traffic

As used in this section, trucks refers to tractor trailer trucks with drivers. Trailers refer to semi-trailers, which are transported cross-lake unattended. This distinction is important with respect to vessel capacity and turn-around time. It is especially important to vessel assignment, since the ITB will not be certified for passengers. In addition, containers are considered as semi-trailers. The lack of container handling equipment requires that they be transported on their over-the-road wheels.

The McMullen study estimates between 2,000 and 2,900 semi-trailer movements per year in 1985 for the upper lake crossing. A conservative estimate would be 2,000 semi-trailer movements per year.

As with the railroad car estimates, these are based upon direct surveys and trend analysis. This estimate is intended to reflect the status-quo.

c. Passengers

The McMullen study estimates that upper lake service to Kewaunee, Wisconsin would generate 28,000 passengers and 10,000 autos. They believe that a route to Manitowoc would generate more volume; however, how much more is not estimated. It is also believed that separating auto-passenger service from rail service would increase auto-passenger volume.

Auto-passenger service is sensitive to rates, marketing, level of service, and route. We speculate that the volume for a Ludington-based auto-passenger ferry would be higher than for a Frankfort-based ferry, based on route considerations.

The McMullen estimates are based on:

- o Data for past cross-lake passenger traffic
- o Data of the summer 1981 demonstration project
- o Past survey results

It was estimated that 10 percent of all inter-state Michigan: Illinois, Wisconsin, and Minnesota pleasure auto trips would use a cross-lake ferry. Potential business person trips were estimated at 5 percent. Most of these trips were assigned to a lower-lake route.

Chapter VI

Draft Land Use Alternatives

CHAPTER VI
DRAFT LAND USE ALTERNATIVES

FUNCTION AND PURPOSE

The fundamental, official document a community uses to set down goals is a long-range land use plan which can be referred to by public officials and private citizens. The Municipal and Township Planning Act, Public Act 285 of 1931, and Public Act 168 of 1959, as amended, specifically give respective planning commissions the authority to prepare and officially adopt a Plan. When prepared, officially adopted, and maintained, this Plan should provide an advisory guide for physical development of the community into the best possible living environment for present and future community residents.

Because our social and economic structure and activities constantly change the Plan, periodic review and revision must reflect contemporary trends while maintaining long-range goals.

To be effective, the Plan must:

- Reflect needs and desires of the people;
- Interpret realistically the existing conditions, trends, and the dynamic economic and social pressures for expansion;
- Inspire approval and cooperation among the various public agencies and citizens of the community so that they will build conformity with the objectives it sets forth.

The Land Use Plan provides:

1. A comprehensive means of integrating proposals that look 15 to 20 years ahead to meet future needs regarding general and major aspects of development throughout the community.

2. An official, advisory policy statement for encouraging orderly and efficient use of the land for residences, business, parks, recreation, and industrial areas, and for coordinating these uses of land within each other and with streets and highways and other necessary public facilities and services.

3. A logical basis for zoning, subdivision design, public improvement plans, and for facilitating and guiding other work of the Planning Commission and the legislative body, as well as other public and private endeavors dealing with the community's physical development.

4. A means for private organizations and individuals to determine how they may relate their building projects and policies to official community planning policies.

5. A means of relating plans (Ludington and Pere Marquette) to plans of adjacent communities and to development of the region as a whole.

The Land Use Plan is intended to be long-range and dynamic; it is based on potentials and projects, population growth, economic development, and ways of living. It attempts to look 15 to 20 years ahead. Present trends such as those indicating lower birth rates, higher energy costs, more leisure time, and higher standards of living have been considered in making plans that anticipate long-range needs. It would be desirable to base plans on even more distant goals, but the unpredictable events that may occur during longer periods make this impractical. Instead, the Plan must be subject to periodic review and revision. Through this process, it will always express 15 to 20 year goals and will reflect contemporary conditions and trends.

THE LAND USE PLAN IS GENERAL IN SCOPE: IT IS NOT INTENDED TO ESTABLISH PRECISE BOUNDARIES OF LAND USE AREAS OR EXACT LOCATIONS OF FUTURE USES. ITS FUNCTION IS TO GUIDE GROWTH TOWARD LONG-RANGE, BROAD GOALS. IT ESTABLISHES THE FRAMEWORK REQUIRED TO ASSURE THAT MORE DETAILED DECISIONS CAN BE RELATED TO THE BROADER SCENE.

ALTERNATIVE LAND USE OPPORTUNITIES

Five alternative land use opportunities have been developed based upon the information gathered and analyzed in the previous sections of this report. Three alternatives are presented for the City of Ludington and two for Pere Marquette Charter Township. Each alternative expresses different land use development philosophies for planning and each will have a different impact on the community.

A common element in all five alternatives is the preservation of the wetland areas adjacent to the Dow disposal lagoons. These natural areas provide important habitat and breeding grounds for Pere Marquette Lake and River. A buffer area is also designated between the wetlands park in conjunction with a township park. These three areas (wetlands park, buffer and township park) will serve to enhance the aesthetic and recreation qualities of the area for enjoyment by existing and future residents and visitors to the area.

Alternative A-1

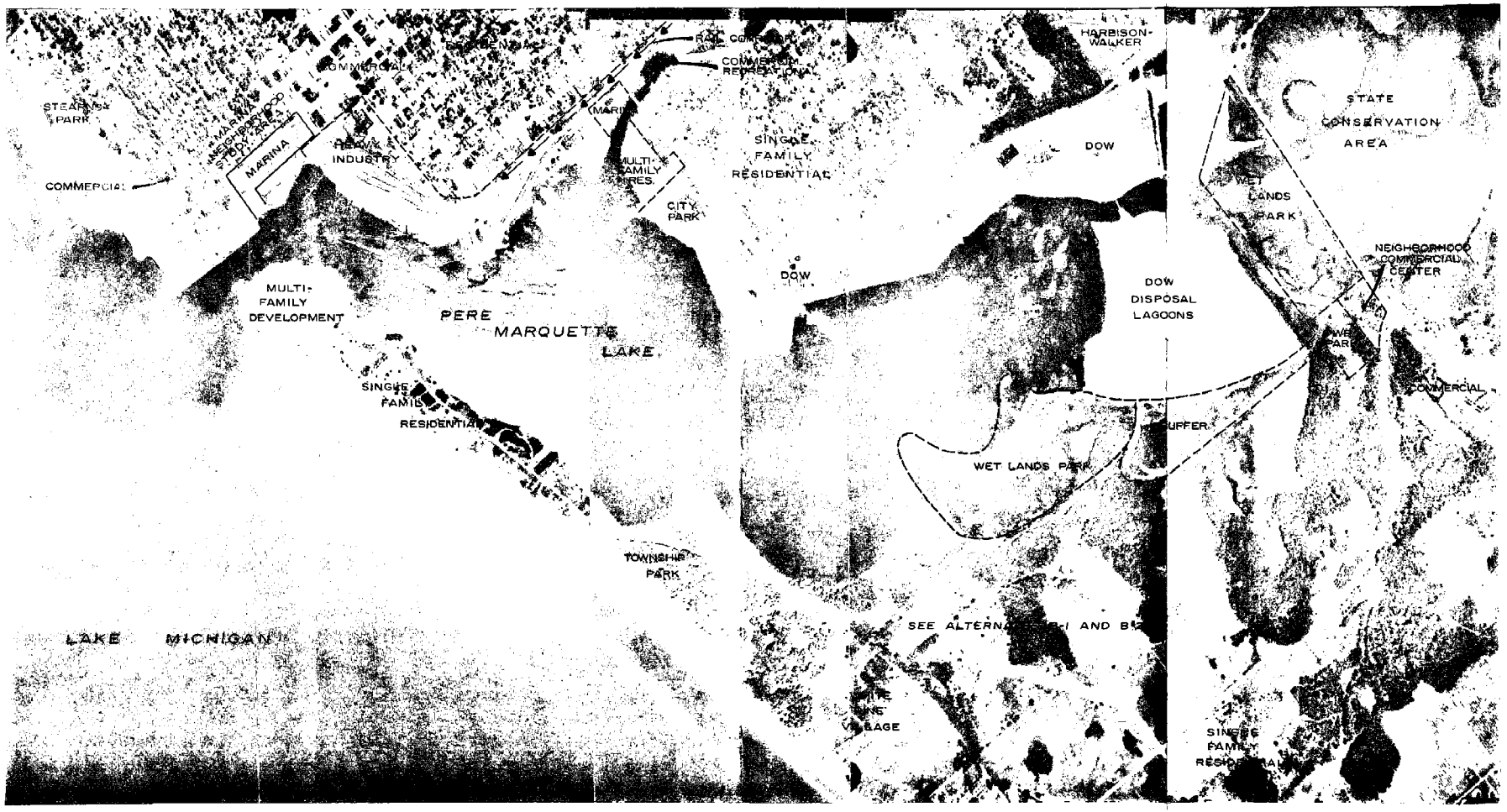
The following figure graphically illustrates the concepts of Alternative A-1. This alternative encompasses land in the City of Ludington from the City Marina to the City Park adjacent to the Dow property.

As can be noted, this alternative recommends that the existing rail corridor be maintained to serve and support industry in the area. This corridor has been, and should be, encouraged to be the backbone of moving goods in and out of Ludington. Coupled with the function of the rail corridor are the adjacent industrial designations. Approximately 35 acres are indicated, recognizing the existing industry and encouraging future industrial development in this area. Chapter V - Feasibility Determination - found the following industrial uses to be marginally feasible in Ludington: cement manufacturing, pulp/paper production, agricultural and chemical processing.

East of this industrial area and west of the bridge, a marina development is proposed. This area could be developed as a marina and/or other water recreation oriented commercial uses. This would take advantage of the existing water frontage and serve as a logical line between the existing commercial/ recreational uses adjacent to the area along the waterfront.

Immediately south of the marina area, multi-family residential housing is proposed. Housing in this area should be of a low-rise medium density character strongly oriented toward the water. These units should not exceed three stories in height nor more than 12 units per acre. As a result, this 5.5± acre site could contain 60-70 dwelling units with a resultant permanent population of approximately 200.

Recent development trends for waterfront properties indicate a stronger potential for seasonal occupancy and the construction of a condominium-type project. In any event, the proposed low-rise medium density development will blend with the existing character while allowing a reasonable density for this location.



LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN

ALTERNATE A-1
LAND USE OPPORTUNITIES

Note: PROPOSED LAND USES ARE OUTLINED WITH DASHED LINES

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Alternative A-2

Alternative A-2 is graphically illustrated on the following figure. This alternative encompasses land in the City of Ludington from the City Marina to the City Park.

Starting at the existing City Park, this alternative proposes to enlarge this park to the north. At present, this park serves as a local recreation facility. The proposed expansion would allow the development of more facilities (e.g., beach, play equipment, fishing, etc.) and upgrade the park to a regional type facility. This regional park will reinforce the recreation/commercial uses existing in the area, plus will act as a tourist attraction.

The Michigan DNR Waterways Division has stated that the westerly shoreline of the park was too exposed for docking facilities and the northerly shore offers water depths that are generally inappropriate for recreational docking facilities. In light of these comments, the future development of this park must be coordinated within these parameters.

Moving north and west, this alternative designates three types of industrial uses - general industrial, marine transportation, and general marine terminal. The general industrial areas are intended to encourage the existing industries to continue and expand, plus provide land for additional manufacturing, warehousing, and storage-type uses. The marine transportation area is intended for uses oriented toward water and land transportation networks. Utilizing the designated highway and railroad corridor, industrial uses would be provided convenience access to needed transportation systems. The marine terminal area is designed to promote Ludington as a shipping and receiving terminal, as detailed in Chapter V-Feasibility Determination. Again, the highway and railroad corridor will facilitate the future development of the marine terminal area by offering two modes of transportation.

LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN

ALTERNATE A-2
LAND USE OPPORTUNITIES

Note: PROPOSED LAND USES ARE OUTLINED WITH DASHED LINES

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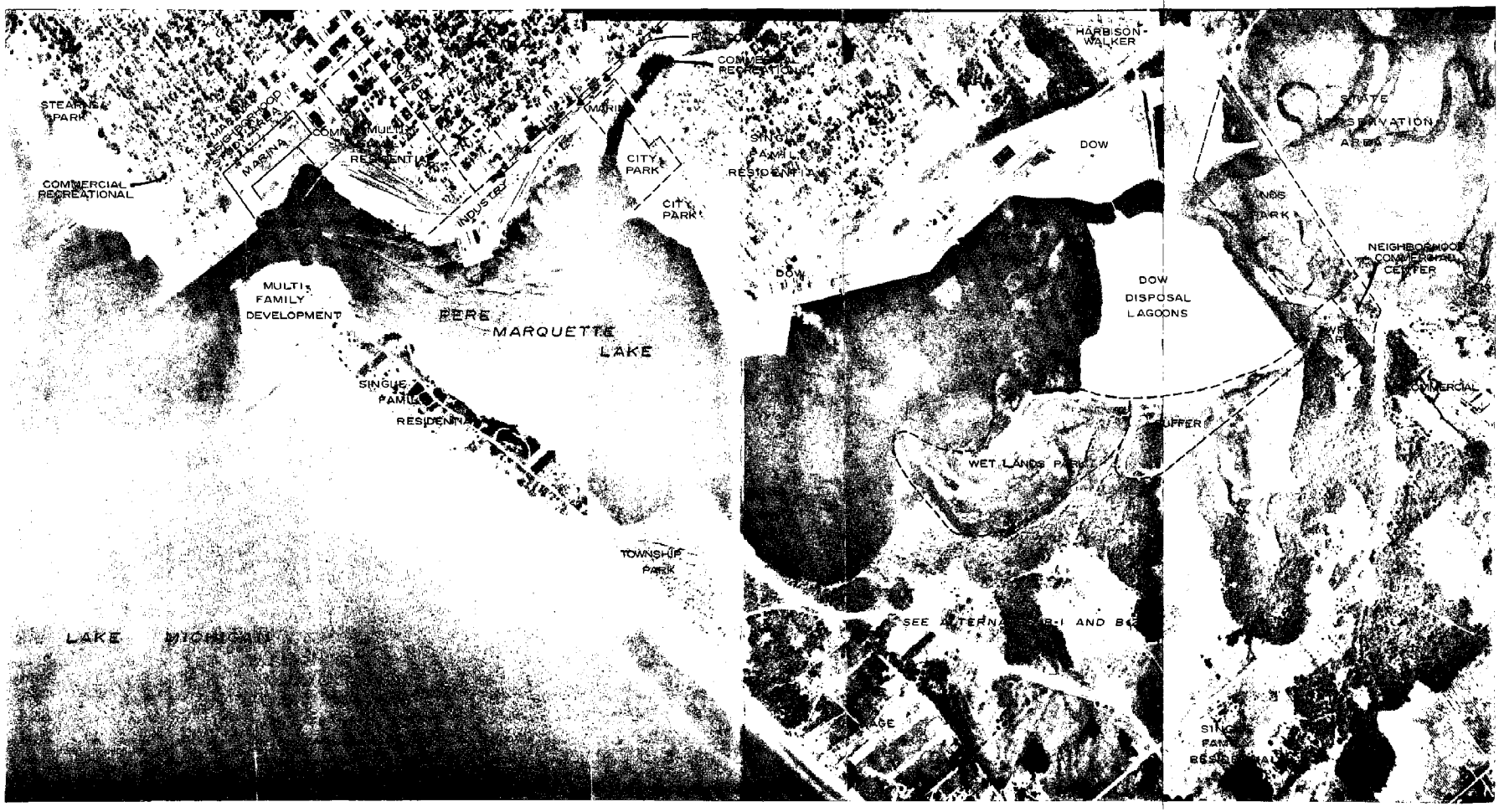
Alternative A-3

As graphically illustrated, Alternative A-3 is similar to Alternative A-1 with respect to the rail corridor, marine, city park, and industry. This concept differs in the area east and south of the city hall. Commercial and multi-family residential uses are proposed.

The commercial area includes the land adjacent to city hall. Commercial uses in this location would be retail and recreation oriented, catering to the needs of the marina users and seasonal visitors along with the downtown shopper. This area could also provide convenience goods for the adjacent multi-family residential area.

The multi-family residential area is proposed to have a low-rise medium density character strongly oriented toward the water. These units should not exceed three stories in height nor more than 12 units per acre.

As a result, this 45± acre site would require extensive redevelopment to adequately provide a desirable living environment. When fully developed, this site would contain approximately 540 dwelling units, resulting in a population of 1,600 persons. This type of development will allow an aesthetically pleasing, well landscaped project, while allowing a density to help support downtown business.



LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN

ALTERNATE A-3
LAND USE OPPORTUNITIES

Note: PROPOSED LAND USES ARE OUTLINED WITH DASHED LINES

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Alternative B-1

Alternative B-1 encompasses land in Pere Marquette Charter Township as illustrated in the following figure. At the present time, access to this area is hampered by a narrow, two-lane road. This alternative proposes an Improved Vehicular Corridor within the existing right-of-way to County Road Commission standards for a major roadway. Immediately north of the corridor, a large (400± acres) multi-family residential area is designated. Approximately a third of this property is tree covered, providing a desirable environment for low-rise, medium density development. This type of project should take full advantage of the natural assets on the site and utilize innovative design concept (e.g., cluster housing, zero lot lines, etc.) to make this area an asset to the community and a desirable place to live. Prior to the development of this site, utilities (sewer and water) will need to be provided at the site. With a potential population of approximately 10,000 to 15,000 people, it will be necessary to have this infrastructure.

A neighborhood commercial center has been located in the residential area to provide convenience shopping opportunities for local residents. Uses in this commercial center could consist of barber and beauty shops, financial institutions, florists and gift shops, self-service laundry and dry cleaning pick-up stations, shoe repair, tailor and grocery store, to mention a few.

To help service the water access needs in this area, a private marina is proposed in the southwest corner of Pere Marquette Lake. As a complement to the marina, an area of commercial/recreational use is designated immediately adjacent. This commercial area would have recreation emphasis and not compete with the nearby neighborhood commercial center.

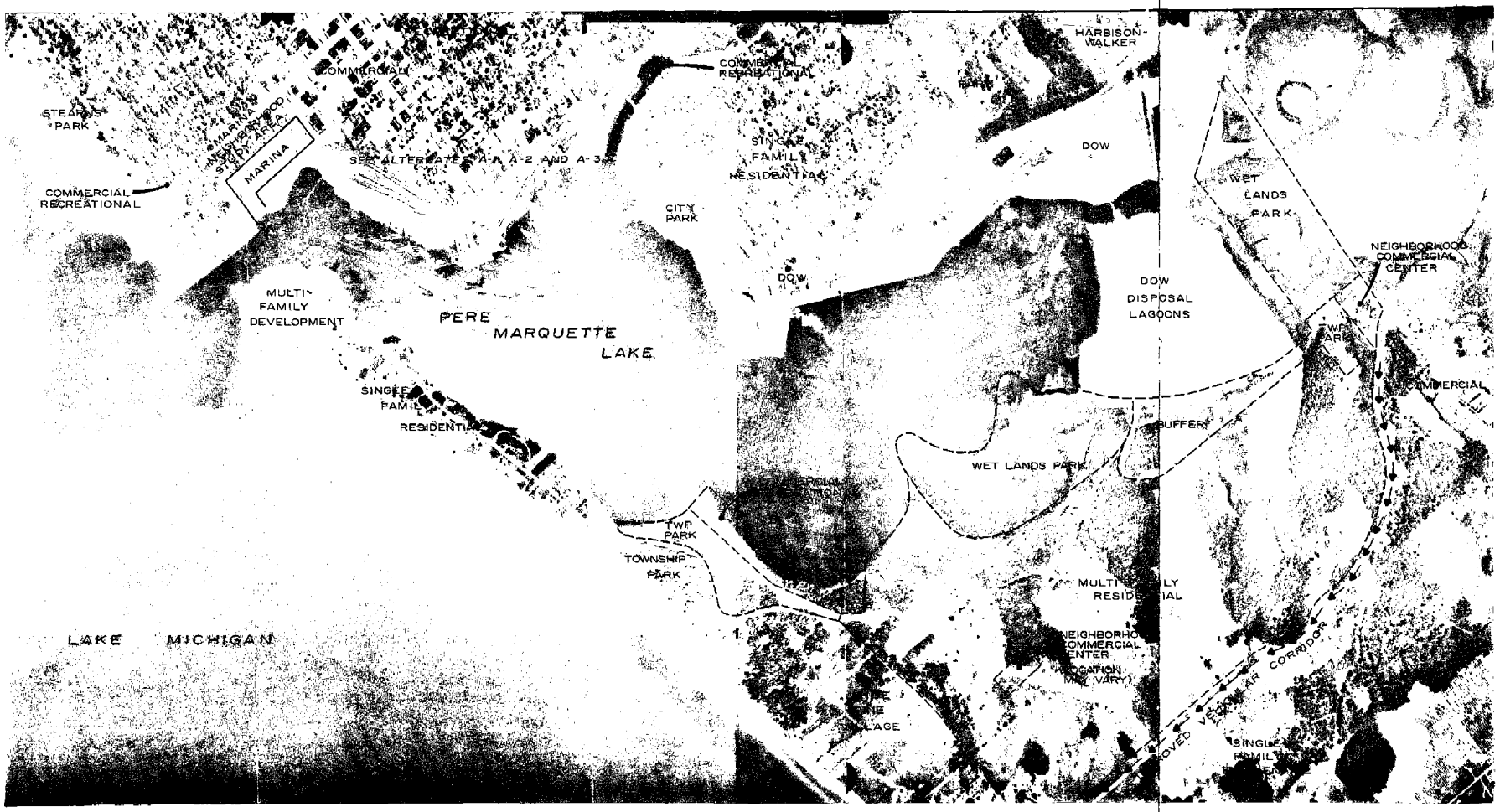

FIGURE 34

LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN

ALTERNATE B-1
LAND USE OPPORTUNITIES

Note: PROPOSED LAND USES ARE OUTLINED WITH DASHED LINES

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Alternative B-2

As graphically illustrated, Alternative B-2 contains land use concepts for Pere Marquette Charter Township. The rural ranchettes area is proposed for development of large lot (1-5 acre) single-family homesites. Since much of the 350± acres is tree-covered, a majority of the 140± sites could be nestled among the trees, leaving a natural-looking environment. If developed as proposed, approximately 400-450 people would populate this area.

North of this area is a multi-family residential area. This 150± acre low-rise, medium density area should be designed and developed with prime consideration to existing natural features. Much of this area is tree-covered, providing desirable living opportunities for the 4,000 to 5,000 people who may inhabit this location.

Moving further north is a commercial/recreational area. This type of development will serve as a buffer between the multi-family area and the existing industry. Next to the industry, a marina development is designated. A small marina operation is proposed to serve the needs of the nearby residents.

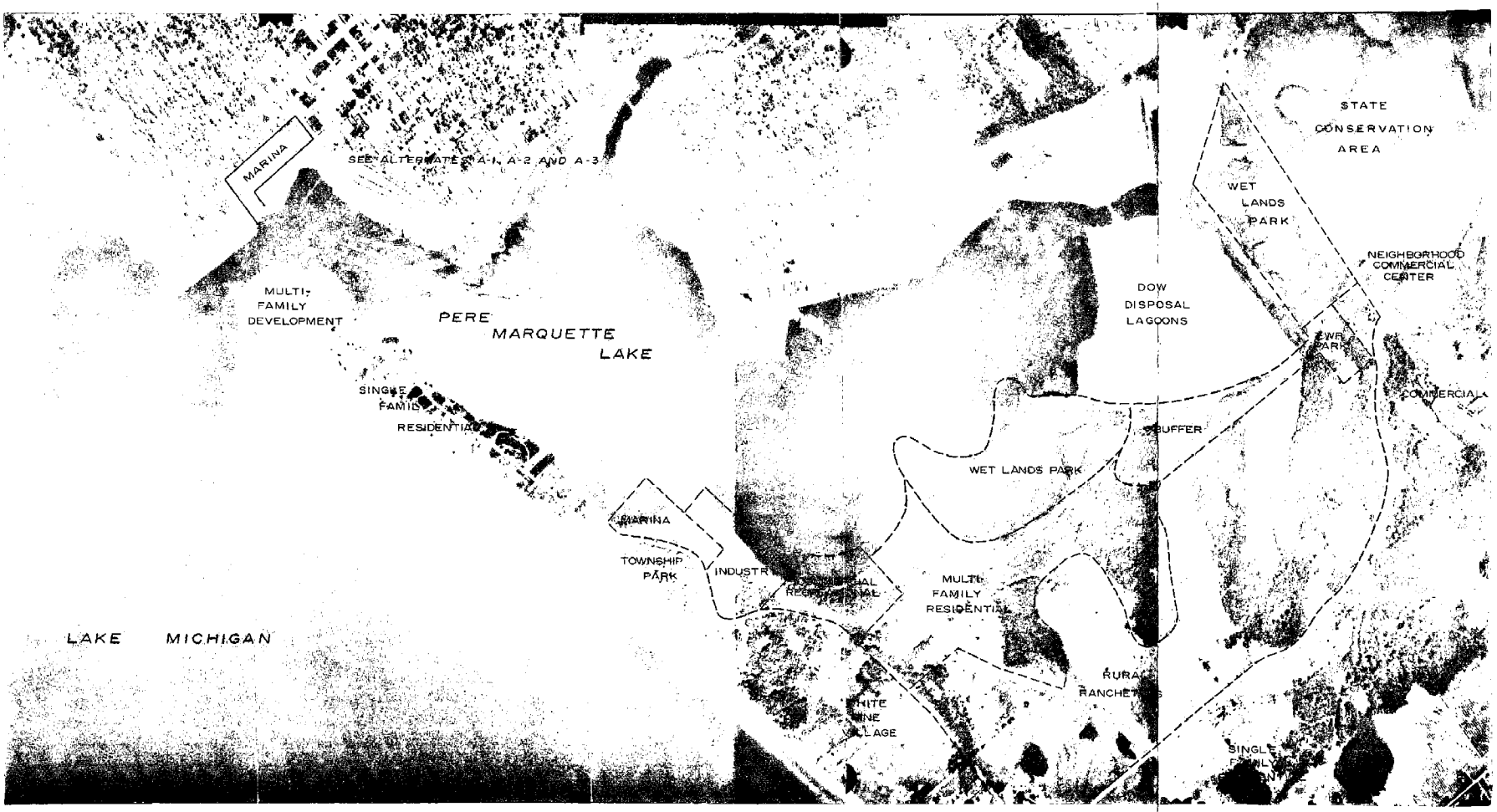

FIGURE 35

LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN

ALTERNATE B-2
LAND USE OPPORTUNITIES

Note. PROPOSED LAND USES ARE OUTLINED WITH DASHED LINES

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Chapter VII
Harbor Land Use Plan

CHAPTER VII
PERE MARQUETTE LAKE LAND USE AND PORT PLAN

INTRODUCTION

The purpose of this plan is to provide a broad framework to meet all the people's needs and activities (current and future). It also has the purpose of fitting these activities (land uses) to the natural characteristics of the land and with existing land uses. It is the further purpose of this plan to encourage and preserve desirable land uses and to discourage certain undesirable land uses.

This plan is based upon the study data and analysis. It also reflects steering committee and public input.

This plan is focused on the Pere Marquette Lake area. It provides for a comprehensive range of land uses, from natural area preservation to heavy industrial.

The discussion of land uses is presented in two sections (Ludington and Pere Marquette Township) for ease of adoption.

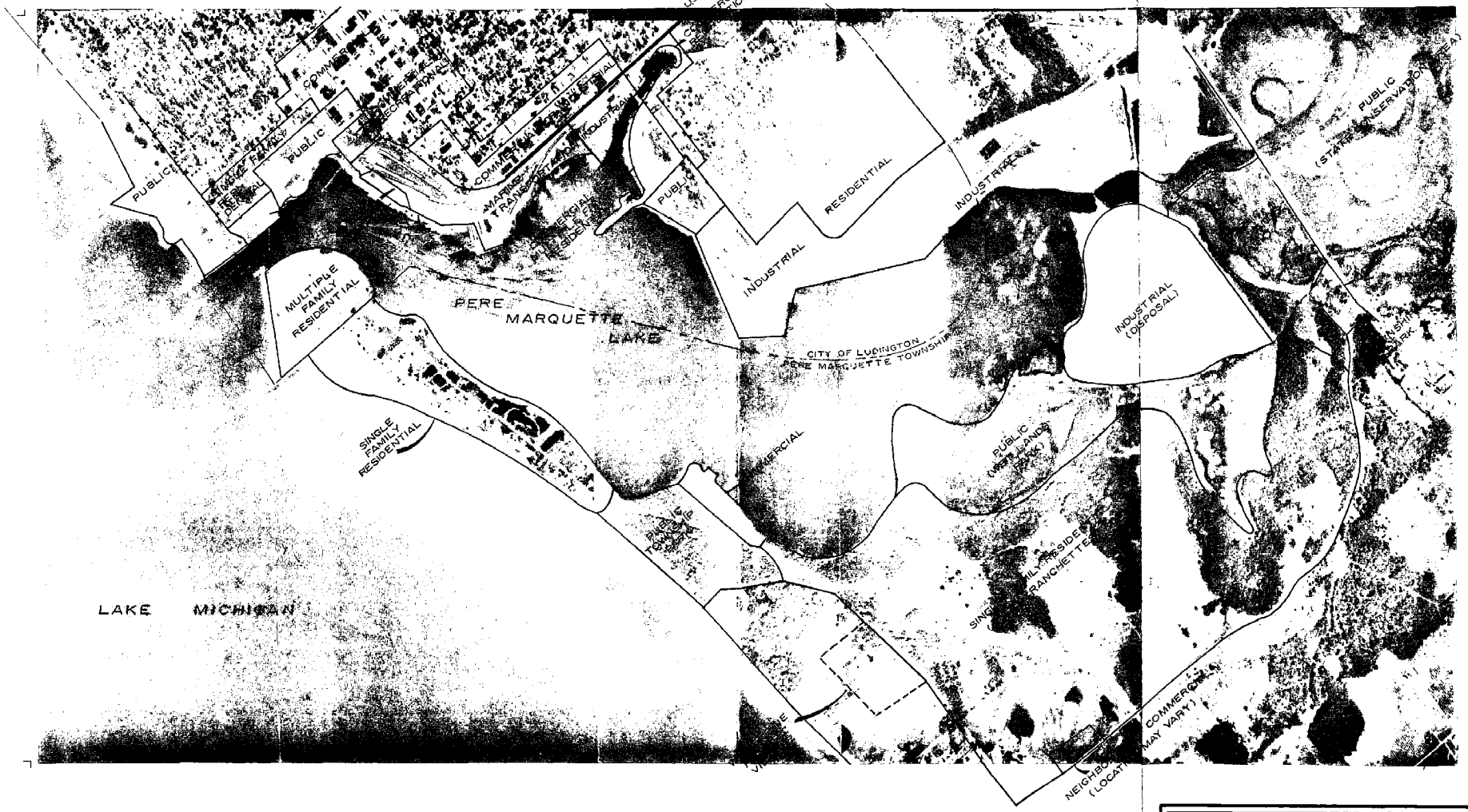
A. GENERAL PLAN CONCEPTS

This plan embodies several concepts which are common to both the City of Ludington and to Pere Marquette Township. These are general development concepts on which the other plan features are based. These concepts include:

1. a balanced use of Pere Marquette Lake, with respect to industrial, commercial, residential, and natural area preservation.

2. the creation of a strong local economy through the use of Pere Marquette Lake for recreational boating and commercial shipping.

3. the preservation and enhancement of desirable land uses along the shoreline.



LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN

FIGURE 36
THE PERE MARQUETTE LAKE
LAND USE AND PORT PLAN

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4. the redevelopment of under-utilized areas or inappropriate land uses.

5. blending of new areas with existing land uses and with the area's natural characteristics.

B. THE CITY OF LUDINGTON: PLAN ELEMENTS

1. Residential

The plan provides for the continuance of the existing multi-family area between the United States Coast Guard station and the new city marina. This small area is developed with multi-family residential.

A second multi-family area, at the end of the Buttersville Bar, is also shown on the plan. Like the first area, it is developed with multi-family residential. It is the new condominium development known as the Crosswinds.

The plan shows one single-family residential area, north of the new city marina. This area reflects the planning results of the marina area development plan.

Another residential area is shown north of the Dow Chemical Industrial Complex. Although bisected by a small commercial strip, it is predominantly single-family developed.

This plan does not seek any change in the character of any of these multi-family or single-family residential areas.

One area, the Western Concrete site (also known as the Blout property) is designated commercial/recreation and multi-family residential. As multi-family residential, it is an attractive site for a seasonal condominium development. A prospectus for condominium development is included in Chapter VIII, Development Opportunities. The commercial/ recreation opportunities are discussed in Section 3, Mixed Commercial.

2. Commercial

The plan shows the downtown area simply as commercial without delineating CBD areas from other types of commercial. No change from existing development patterns is contemplated, except near the Star Watch Case facility.

The Star Watch Case facility is planned for redevelopment as an office facility. It would provide almost 100,000 square feet of office space for a large business such as a research and development facility, a professional design firm, a computer processing center, or municipal offices. A prospectus of redevelopment for this facility is included in Chapter VIII, Development Opportunities.

The plan also provides for the development of a major hotel/restaurant complex south of the Star Watch Case facility. A hotel at this location would enjoy a good proximity to the downtown. It would have a good view of Pere Marquette Lake, the harbor channel, and Lake Michigan. Its view, however, would overlook the marine bulk terminal. If a hotel/restaurant is not developed on this site, it could be used for general commercial, commercial recreation, or light industrial.

The area immediately south of the city hall is planned for commercial recreation. It is well related to the new marina and enjoys an excellent view of the entrance channel and outer harbor. Commercial recreation is intended to include those retail uses which are especially tourism oriented. Examples include: restaurants, handicraft shops, antiques and art galleries, bait and tackle shops, marinas and boat rentals, and the like.

The area west of the Washington Street Bridge is also designated commercial recreation. This area presently supports several marinas. The commercial area along Washington Street, immediately south of the bridge, is presently mixed commercial. It should be encouraged to develop as commercial recreation with special emphasis on antique shops, art galleries, and handicraft shops.

3. Mixed Commercial

The area immediately north of the C&O Railroad yards, north to Dowland Street is planned for a mix of commercial and industrial. It could support heavy commercial uses or provide expansion space for light industrial uses.

The Western Concrete site, also known as the Blount property, is proposed for commercial/recreation or multi-family residential. As commercial/recreation, it is especially attractive as a major hotel/restaurant site. It enjoys good views of Pere Marquette Lake and overlooks the Buttersville Bar and Lake Michigan. A prospectus for hotel development is included in Chapter VIII, Development Opportunities.

4. Industrial

The plan shows the Dow plant as industrial. This reflects its current use.

A second industrial area is shown just west of the Washington Street Bridge and south of the C&O Railroad tracks. This area includes a variety of small industries, some of which are only marginally viable. The eastern portion of this area is proposed for industrial redevelopment. It is a good site for a small recreation boat manufacturer or a heavy repair boat yard. Redevelopment of this site could be aided by the relocation of Lake Street, along the railroad tracks. A development prospectus for this site is included in Chapter VIII, Development Opportunities.

5. Marine Transportation/Terminal

The C&O Railroad property is shown as partly marine terminal and partly marine transportation. The marine terminal is shown along dock No. 1½. Uses proposed for this site include a bulk petroleum terminal and a small bulk construction aggregate terminal. These terminals are discussed in depth in Section D, Port Plan Features. A development prospectus for each of these is included in Chapter VIII, Development Opportunities.

The marine transportation facility is intended to support a car ferry and in the future, the Integrated Tug Barge. Since much of the railroad car marshalling and train makeup is done inland, the smaller area allocated for marine transportation should not affect the car ferry/integrated tug barge viability. Marine transportation facilities are further discussed in Section D, Port Plan Features.

6. Public Uses

The existing Lake Michigan beach, boat launch, and U.S. Coast Guard station are shown as public use on the plan. Likewise, the city park between the Western Concrete property and the Dow plant is also shown as public use.

The new city marina and city hall are also shown as public use. If the city hall ever is moved to another location, then its present site could be used for commercial/recreation.

7. Transportation

The plan assumes the continuance of waterborne shipping for Dow Chemical and Harbison-Walker. The plan also assumes the continuance of the inter-regional service of the car ferry and possible service by the Integrated Tug Barge. The import of bulk construction aggregate is provided for by the marine terminal.

An access route will be necessary if and when both the dry bulk terminal and the petroleum terminal are fully developed. The plan calls for the development of a limited access truck route parallel to the existing railroad tracks. This will provide a direct route to the bulk terminal.

C. PERE MARQUETTE TOWNSHIP: PLAN ELEMENTS

1. Residential

The plan provides for about 400 acres of residential in the upland sloped areas on the south side of Pere Marquette Lake. This area lends itself to low-density, single-family residential. This area should be developed with prime consideration to existing natural features and constraints. In particular, the wetland areas must not be degraded as a result of this area's development.

This area is designated for rural ranchettes, large lot (1 to 5 acre) single-family homesites. Since about 350 acres is tree-covered, many of the 140± sites could be nestled among the trees, leaving a natural-looking environment. The larger ranchettes could support gentlemen farms or equestrian activities. If

developed according to this plan, about 1400 people eventually would populate this area.

The plan also shows two single-family residential areas, along the Lake Michigan shoreline, and on the Buttersville Bar. This reflects past development and it is anticipated that future development will be similar. The plan provides for the continuance of the White Pine Village.

2. Commercial

The plan provides for three small commercial areas. The existing commercial area on US-31 is shown on the plan as commercial.

A small commercial area is shown inland in the rural ranchette area, however, the location of this area is not fixed. It is intended to provide convenience goods and services to the neighborhood population. It should not be developed until the population is in place to support it. Its size and location must be tightly controlled to insure neighborhood service and not neighborhood disservice. A third commercial area is the Sand Products site. At some future date, when this site is no longer needed for sand export, it would be a good site for a first-class restaurant or a small lodge. This site enjoys some interesting views of Pere Marquette Lake, the wetlands, and the City of Ludington. This site could also be developed with seasonal convenience retail thus eliminating the need for the new neighborhood commercial area (described above).

3. Industrial

Two sites in Pere Marquette Township are shown as industrial on the plan. They are the Harbison-Walker plant and the Dow Disposal Lagoons. The Harbison-Walker designation reflects its current use. The disposal lagoons are intended to be limited to disposal operations and must be in compliance with state regulations. Future use of this land for industrial development is questionable.

4. Public Use

The plan provides for two public use areas. The first is the existing Township park on Lake Michigan. It is planned that this park will expand to the east to Pere Marquette Lake and the area behind the Sand Products facility.

The second public use area is the wetlands along the south side of Pere Marquette Lake. These surround the Dow Disposal Lagoons on three sides. Some of this area is planned as preserved open space with no development activity. Some of this area could be developed as a wetlands nature center with educational stations and guided tours. Development should be limited to upland areas, except for boardwalks into the wetlands. This area also includes a new Township park, developed in an upland area near the US-31 neighborhood commercial center.

D. PORT PLAN FEATURES

1. Regional Terminals

This plan allows for the continuance of the Dow Chemical/Harbison-Walker Terminal. However, it provides for the regional import (or export) of other dry bulk materials at the planned marine terminal. This will free up other sites, such as Mohawk Transportation and Western Concrete for redevelopment. Neither of these sites is extensively developed, therefore, operations could be moved to a new terminal with relative ease. Unless an alternative terminal is provided, these sites cannot be redeveloped.

The data collected through contacts with existing dry bulk terminal users indicated a current importation of about 12,000 tons annually. The U.S. Army Corps of Engineers reports that in 1979, 18,700 tons of sand, gravel, and crushed rock were received in the Port of Ludington. It is possible that some of the Corps of Engineers reported imports were an inter-regional commodity flow utilizing the car ferry.

Since there is an existing need for at least 12,000 tons annually, a small terminal is planned as Phase I. This terminal would have a minimum of capital

improvements and administrative organization. A prospectus for the Phase I dry bulk terminal, which details development and operational costs, and site layout, is included in Chapter VIII, Development Opportunities.

The data collected through contacts with potential dry bulk terminal users showed a demand for at least 56,500 tons annually. Contacts included the State of Michigan (Office of Management and Budget), Mason County Road Commission, Lake County Road Commission, the Wexford County Road Commission, three trucking/ construction companies, and five redi-mix concrete product manufacturers.

The State of Michigan, Office of Management and Budget, expressed little interest in using the Port of Ludington because it might lower volumes, thus raising prices at other ports. Five of the other contacts indicated an interest in using the terminal. The contacts made, which represent about half of the potential users, yielded a little more than half of our estimated annual tonnage. Therefore, the dry bulk terminal volume estimates of 110,000 tons annually (Chapter V, Feasibility Determination) could be obtainable, in time.

The Phase II dry bulk terminal prospectus, which details development and operational costs and site layout, provides for a larger public terminal. This terminal, which could handle about 55,000 tons of material at a time, could be developed as demand expanded.

A bulk petroleum terminal is also shown at the C&O Railroad dock No. 1½. The direct contacts indicated little interest in a public terminal, as private terminals are typical of the industry. Since there are several wholesalers in the Ludington area, there is a good potential that a terminal operator could be attracted to this site. A development prospectus for a bulk petroleum terminal is included in Chapter VIII, Development Opportunities. A bulk petroleum terminal is an appropriate private sector project.

2. Inter-Regional Terminal

The plan provides for the continuance of the C&O Railroad facility as either a car ferry or integrated tug barge terminal. The Kerney & McMullen studies identified a good potential for cross-lake railroad car ferry traffic. A

sizable flow of passengers has also been identified. The continuance of cross-lake railroad car, automobile/ passenger and truck-trailer service is considered vital to Ludington's economy.

In the future, it is possible that the northern area of the C&O Railroad facility could be put to another use. This should not affect the viability of the car ferry terminal.

3. Harbor Improvements

No major harbor improvements are necessary under this plan. The existing harbor entrance, navigation channel, turning basin, and aids to navigation are adequate. Some improvements to the C&O Railroad dock No. 1½ are necessary and their costs are included in the development prospectus. In addition, McMullen Assoc. recommends some modifications to the wing fender and the pile cluster at C&O Railroad dock No. 2. These modifications are necessary for the integrated tug barge.

E. IMPLEMENTATION

1. Port and Terminal Management Options

A variety of organizational structures can function as the lead agency to implement the port and terminal plan elements. The advantages and limitations of each are discussed in this section. Particular emphasis has been placed on the advantages and limitations of each with respect to Ludington.

a. Ludington Harbor Commission

The Ludington Harbor Commission is an advisory body to the Ludington City Commission. It is established by the City Ordinance in accordance with responsibilities similar to those of Public Act 234 of 1925, as amended. Public Act 234 of 1925 has been repealed by the Port Authority Act (P.A. 639 of 1978); however, the repeal is not effective until the Harbor Commission has converted to a port authority.

As the Harbor Commission stands now, it may study and recommend improvements, but has limited means of implementation. It must seek the assistance of another agency to undertake physical development or promotion. Furthermore, it has no responsibility to undertake such development or promotion.

Another serious deficiency with the Harbor Commission is its lack of regulatory authority. It can not make and enforce rules and regulations. Furthermore, it does not have regular input to the Pere Marquette Township Board nor does the Township Board have regular input to the Harbor Commission.

Despite its disadvantages, the Ludington Harbor Commission has several advantages. The first is that it is an existing, functioning body. Its members are familiar with all aspects of Pere Marquette Lake. The second advantage depends upon its individual members. No single agency, no matter how broad its powers, can implement a comprehensive plan single- handedly. It must have the support of many agencies. This requires a continuing effort to "sell" the plan.

Given an operating budget, some individual initiative, and some minor organizational changes, the Ludington Harbor Commission could become the lever which moves a host of agencies into action.

b. Port Authority

Public Act 639 of 1978 created an agency new to Michigan, the Port Authority. The creation of a port authority requires approval of the voters within the county it is located and approval by the Governor. A combination of cities and counties (including at least one city and one county) may incorporate a port authority, however, no direct township participation is provided for.

The authority is eligible for state assistance for 50% of its annual operating budget. It may also seek grants for specific projects. The port authority is a body corporate and politic. It may own and operate a wide

variety of harbor facilities, terminals, bridges and ferries, waterways and lands, and the like.

The port authority can regulate (i.e., zone) waterways, including pierhead lines. It can promulgate safety and environmental regulations.

Port authorities make "payments in lieu of taxes" on public income producing property; however, other public property is exempt. Port authority property used for private purposes is taxable as private property.

The chief disadvantage of the port authority approach in Ludington is the limited scale of viable development and income producing projects. Since many of Ludington's terminals are privately owned and operated, there could be much activity, but little port authority revenue.

Another disadvantage of the port authority approach is the lack of direct Pere Marquette Township participation. Pere Marquette Township would have to depend upon the county for representation; however, the county must represent all its constituent units.

A less significant problem could be the reliance on state funds for operating expenses. a port authority's annual operating budget is subject to approval by the Michigan Department of Transportation and appropriations by the State Legislature.

The advantages of a port authority are many and fairly obvious. They include: regulatory authority, real estate ownership, terminal operation, bonding and fee collection, state operational funding, and grant eligibility. In short, a port authority can plan, decide, develop, and operate.

c. Independent Public Action/Private Development

This approach could also be termed the "non-lead agency - all independent approach". Under this approach, no agency or a very ineffective agency would be given the responsibility of implementing the plan and managing the port. Each agency would be requested to implement that which it felt

timely and important. Likewise, the decision as to what is and what is not an agency's responsibility would be left to each agency.

The principle advantage to this approach is its simplicity, and low "up-front" cost. It also makes use of existing agencies and private developers. The disadvantages of this approach are many, and could be ruinous. Since each agency would act according to its own time table, development would be haphazardous at best. Many projects could be delayed for years while two agencies waited for each other to act. Without a lead agency advocating implementation, important projects could inappropriately lose priority status.

Development, regulation, and management, when it did happen, could be contradictory, duplicative, or uneconomical. A lack of coordinated timing could delay a project and drive costs up.

d. Pere Marquette Lake Council

Under this approach, a joint council representing Pere Marquette Township, the City of Ludington, and Mason County would be established. It could also include the Mason County Economic Authority or other similar agencies.

Such a council would be organized under the authority of Public Act 66 of 1952, Harbors, Channels, and Other Navigational Facilities, or under the authority of Public Act No. 7 of 1967, the Urban Cooperation Act.

Under P.A. 66 of 1952, political units may create a joint agency to:

- govern the use of waterways, channels, harbors, and other navigational facilities;
- adopt ordinances and rules to safeguard the public;
- be empowered to undertake these duties;
- employ a harbor master and other officers with full police powers.

An agency created under this Act is not a corporate body. It is an extension of the constituent government units. It cannot tax, issue bonds, or own property. It is financially dependent upon the parent governments.

The principal advantage of a joint council, created under Act 66 of 1952, would be the ability of each political unit to be involved. This should aid effective development and management.

Another advantage would be the council's ability to promulgate environmental and safety regulations. It should, however, be noted that certain state and federal laws would remain in force. Using the existing Harbor Commission as the lead agency, the Pere Marquette Lake Council could also act as a catalyst to move other agencies to action.

The principle disadvantage of such a council are financial and operational. Financially, the council could be so dependent on the parent governments that it might not be able to get its activities started.

A Public Act 66 joint agency is operationally hampered by the prohibition on owning land. This would make assembling land for redevelopment, or developing a terminal very difficult.

e. Economic Development Authority/Economic Development Corporation

Under this approach, a local economic development authority/ economic development corporation (either city or county) would be charged with port/terminal plan implementation. An EDA/EDC has the ability to issue bonds for public and private development, own land, and operate facilities. It does not have the ability to promulgate rules and regulations for environmental control.

The principle advantage of the EDA/EDC approach are financial and operational. The EDA/EDC can issue bonds and raise capital. It can cooperate with private industry for development and expansion projects.

The principle disadvantage of this approach is the lack of direct control.

2. Agency Responsibilities

This section of the plan recognizes the roles of the many federal, state, and local agencies which will be involved in various stages of implementation of the plan. The responsibilities of these agencies range from ownership and management of port facilities to serving the development plan in various advisory capacities. Naturally, local agencies will have the most active roles in establishing policy and making decisions, while state and federal agencies will mainly be involved in a regulatory and/or advisory capacity, with some exceptions.

a. Local Agencies

Planning Commissions (Ludington and Pere Marquette Township): The local planning commissions will be involved in long and short range planning for port developments, particularly with respect to the needs and concerns of the two communities. They are directly concerned with site plan approvals, zoning changes, and comprehensive planning.

City Commission/Township Board: The Ludington City Commission and the Pere Marquette Township Board will have central roles in the implementation actions either directly or indirectly, such as the creation of a lead implementing agency.

County Commission: The Mason County Commission can have a significant participation in the implementation of the plan. They can provide administrative and financial support and marketing assistance.

County Economic Development Authority: The Mason County Economic Development Authority is a semi-autonomous body concerned with county-wide economic development. The Mason County EDA historically serves as a financial resource. It also could act as a promotional and development agency.

West Michigan Regional Planning Commission: The Regional Planning Commission, in order to coordinate its comprehensive planning program and address the needs of the many communities in Region 8, will provide input on the plan and its implementation.

b. State Agencies

Michigan Department of Transportation (MDOT): The MDOT is the primary agency in Michigan involved with commercial navigation, and its activities in this area include planning, development, policy formation and analysis, and provision of grants and operating assistance. It also provides liaison between other agencies involved in commercial navigation, in addition to the private sector.

Michigan Department of Natural Resources (MDNR): Activities of the MDNR are mainly related to environmental protection during such projects as harbor or channel dredging and other construction on or near Michigan's waterways. The MDNR and U.S. Army Corps of Engineers have somewhat overlapping regulatory functions for projects on the Great Lakes, and typically issue a joint permit for these approved activities.

Michigan Waterways Commission: A Commission of the MDNR, the Waterways Commission's powers include the acquisition, construction, and maintenance of recreational harbors, channels, docking, and launching facilities, and the administration of commercial docks in the Straits of Mackinac. The commission provides control of recreational boating in Michigan, and collects a tax on fuel used for boating. The commission will be actively involved in any developments related to recreational boating in Ludington.

Michigan Interagency Port Council: As the name implies, this agency exists to assure an appropriate balance between the aims of other state agencies involved in port development. Its members are representatives of the MDOT, MDNR, and state departments of commerce and agriculture.

Michigan Environmental Review Board (MERB): The purpose of this agency is to review projects in Michigan of major environmental significance. With respect to Great Lakes Ports, these activities would primarily be harbor and channel dredging. The state departments of Agriculture, Commerce, Management & Budget, MDNR, Public Health, MDOT, and the Attorney General are represented on the MERB.

c. Federal Agencies

International Joint Commission (IJC): The IJC was created between Canada and the U.S. to study problems along the water boundary. The IJC also has control over the surface levels of the boundary waters through the power to approve of any use, diversion or obstruction which may alter the water levels. Thus it has an impact on commercial navigation on the Great Lakes.

U.S. Army Corps of Engineers: The Corps of Engineers serves as designer, builder, and operator of navigational facilities authorized by congress, in addition to a wide range of planning and development activities. The recent harbor improvements in Ludington illustrate the Corps' involvement in commercial navigation. These improvements and channel depths are maintained by the Corps on an on-going basis. The Corps also issues joint permits with the MDNR for approved activities on or near the Great Lakes which could affect water quality and/or navigation.

U.S. Customs and Immigration Service: The U.S. Customs and Immigration Service is the agency of the Federal Government responsible for the control of goods and people across our national borders. Since only Dow Chemical and Harbison-Walker have any regular international shipping, the U.S. Customs and Immigration Service has a minor role in Ludington's port activities.

U.S. Maritime Administration: This agency regulates waterborne shipping in foreign and domestic offshore commerce in the United States. It publishes long-term forecasts of waterborne foreign trade and other informational publications on the U.S. Merchant Marines and shipping.

U.S. Economic Development Administration: The U.S. Economic Development Administration is responsible for administering certain economic development local government grant programs and certain economic development private sector loan programs. These grants and loans are described in Section 3 of this chapter.

U.S. Coast Guard (USCG): The Coast Guard has many responsibilities concerning commercial navigation and recreational boating, including maintenance of navigational aids, ice breaking services, vessel inspection, pollution control and cleanup, search and rescue, law enforcement and boating safety. The Coast Guard also compiles daily observations of weather and wave conditions which can be useful for design purposes. The U.S. Coast Guard station in Ludington is located along the harbor entrance channel next to the Municipal Marina.

3. Funding Sources, Land Acquisition Methods, and Development Incentives

The purpose of this section is to present alternative funding sources, land acquisition methods, and development incentives. Implementation of complicated plans require the use of many of these tools. This discussion is intended to provide a basic summary.

a. Funding Sources

Although there has been much publicity about grant cutbacks, there are still many grants available. Competition is tough, but a sound project in an economically depressed area can be successfully funded.

The most viable grant program in Michigan for economic development is the HUD Small Cities Block Grant program. The Michigan Department of Commerce is administering this program and they have established a selection procedure which favors job producing projects in economically depressed areas, with supporting private funding and grant paybacks. This payback feature can be of great benefit to the local community because these monies are earmarked for the community's use. In this way, the grants are converted to low interest loans which in turn become the basis of an economic development revolving fund.

The U.S. Economic Development Administration has local public works grants which cover design and startup administration, land acquisition, and construction. These grants are available in economically depressed areas only. These grants require a 50% non-federal match.

The U.S. Maritime Administration provides grants for comprehensive port planning. These grants require a 50% non-federal match.

The U.S. Department of Interior, under former heritage conservation and recreation service programs, has urban park and recreation recovery grants. These may be used for redesign, and rehabilitation of existing public parks. These grants require a 30% non-federal match.

The U.S. Army Corps of Engineers has a harbor cleanup program. Its purpose is to improve channels for navigation.

The U.S. Department of Housing and Urban Development has urban development action grants (UDAGs) which are designed to assist the private sector with urban redevelopment projects. They may be used for residential, commercial, or industrial projects.

The Michigan Waterways Commission makes grants for boat launch ramps, harbors of refuge, and public marinas. A Waterways Commission grant was used for the new city marina.

The U.S. Economic Development Administration also has a loan and loan guarantee program to assist private sector projects, in economically distressed areas. Monies under this program may be used for land and building acquisition, machinery (process), construction, and rehabilitation. These loans require a 35% non-federal match.

A few of the many foundation grants may be used for activities outside of the areas of the humanities, arts, and recreation. These should be tapped for special arts and recreation activities.

Several foundation programs are development/redevelopment oriented. The National Trust for Historic Preservation has been providing grants for preservation of historic marine vessels or maritime heritage in "significant" communities. Typically, these are the focus of tourist and recreation activities.

The National Trust for Historic Preservation, through its main street program, makes grants for the rehabilitation or adaptive reuse of historic structures. The Star Watch Case facility is a candidate for this type of grant.

The Audubon Society and other similar nature conservation groups have purchased land and established private nature parks. The Pere Marquette Lake wetlands is a candidate for this type of foundation activity.

The standard financial institutions - banks and mortgage companies, savings and loans, insurance companies, and retirement funds can play an important role in plan implementation. Banks and mortgage companies make loans for residential, commercial, and industrial projects of all sizes. Savings and loans usually make loans only for individual residences; however, they can play an important role in the resale of a condominium project. Insurance companies and retirement funds participate in large projects of all types. They usually do not participate in projects smaller than one or two million dollars.

Various agencies have the authority to sell bonds to raise capital for projects. Bonds fall into two categories - general obligation and revenue. General obligation bonds are sometimes used to fund projects which benefit the community as a whole. They usually require a vote of the people, and are paid off with general tax revenues.

Revenue bonds are paid off with revenues raised by the project or by the benefitting industry, according to a repayment schedule. With the assistance of a public agency issuing bonds, a private sector business or industry can get a loan at lower than market rates.

Public agencies which can issue revenue bonds include: the City of Ludington, Pere Marquette Township, Mason County, the Ludington Economic Development Corporation, the Mason County Economic Development Corporation, and the Mason County Industrial Development Corporation.

Another method of raising revenue for public improvements is tax increment financing. In this situation, a public body pledges to use the new tax revenues, generated by certain private sector improvements, to develop public infrastructure benefitting that private sector industry. This is an "I will, if you will" approach. For example, a factory wants to expand but can't because the public water main to its factory is not large enough. Therefore, the factory will not expand until the water main is enlarged. Meanwhile, the city (or township) will not enlarge the water main until there is a real need, but it nevertheless would like to see the factory expand. The solution is for both to agree to move ahead simultaneously, with the city using "borrowed" monies in anticipation of new tax revenues for repayment.

b. Land Acquisition Methods

Land and buildings may be acquired or used under a variety of mechanisms. Each has its own advantages and disadvantages for meeting an owner's terms and a buyer's needs.

The most direct means of obtaining property is to buy it outright. This involves buying all or most of its associated rights including the right to resell it. Unless a "bargain sale" or gift is involved, it can be the most expensive.

A second technique is called leasing. Under this technique the owner "rents" property for a relatively long period, usually 20 years at minimum. The leasee has the responsibility for maintenance and may make major improvements to the property. The property owner can include operations requirements in the lease and at the end of the lease period it reverts to the owner's use and control. Leases are often used for temporary uses, where the owner expects a greater future value.

A third technique is called land writedowns. Under this technique, a local government acquires blighted or run-down real estate through tax reversions, fee-simple purchase, and condemnation. By clearing the land, assembling it into large tracts, or making other improvements, it increases its utility and, therefore, its value. The government, however, sells or leases the land at below its new market value. The purchase of these properties at depressed prices (due to blighting), acquisition of major parts through tax reversions, the creation of "new" land through road abandonments, and the condemnation of hold-out properties to assemble large tracts; usually permit the government to cover their costs while providing a private sector development opportunity. Michigan law permits the condemnation of land in blighted areas for redevelopment purposes. This is a very effective redevelopment tool because often the private sector can not assemble a large enough parcel for a major user.

A fourth technique for controlling the use of land is easement purchase. Historically, easements have been granted or sold for access or for utilities. Easements can be purchased for any of the many rights that come with property ownership. Recently, easements have been granted for historic preservation of building facades, open space and natural area preservation, or scenic vistas. Easements may be temporary or permanent. The proposed wetlands boardwalk could transverse Dow Chemical's wetlands by easement.

A fifth technique for acquiring land is to trade for it. Land is often exchanged in small amounts to increase the utility of a parcel. If surplus land is available, it can be an inexpensive way of gaining other needed land.

c. Development Incentives

Some activities are intended to make development or redevelopment more attractive. These can be grouped as financial assistance, technical assistance, and the elimination of "red tape".

Among the financial assistance programs are the insured/guaranteed loan programs of the Small Business Administration and the Economic Development

Administration. Under these programs a business or industry can qualify for a lower interest rate loan because of the backing of a government agency.

Under Michigan law, a municipality may abate local property taxes for a new or enlarged business or industry. This abatement may be for up to 50% of its taxes for a period of up to 12 years. This has been widely used to encourage local community and industrial expansion.

The Preservation and Tax Reform Act of 1976 provides for major tax credits for historic property rehabilitation. Section 2124 provides that a developer may deduct, from his federal income tax, most of the costs for certified rehabilitation of a "certified historic structure". Recent amendments provide for a tax credit of up to 25% for certain rehabilitation.

Many communities in Michigan have undertaken joint public/private development activities. The Ludington public marina could be considered to fall within this category. It is a public project which directly supports the local tourism and recreation industry. The proposed public dry bulk terminal also fits into this category.

Many local governments stand ready to offer technical assistance to new or expanding enterprises. A development coordinator, the most visible, helps secure grants or provides community facts. Sometimes cities hire a design firm to help downtown businessmen with storefront improvements, or the city engineer publishes important engineering data for all to use. In some areas the local Chamber of Commerce or the electric power company also provide technical assistance to developers.

A city's staff, particularly in the areas of building and zoning codes, fire and life safety codes, and engineering can greatly aid development by adopting a "work-with" attitude. This need not be done at the expense of proper and complete code enforcement.

4. Zoning Ordinance and Map Review

Zoning is an important tool for implementing the plan, and will encourage orderly and compatible development in accordance with the goals of the plan. It will also help to insure that the best use is made of lands in the port area, and that the locational needs of potential investors in commercial or industrial facilities may be met.

Several zoning changes were anticipated as a result of this plan. A review of the existing zoning map compared to the proposed Pere Marquette Lake Land Use and Port Plan has revealed differences that need to be addressed. Likewise, the zoning ordinance permitted uses are in some cases in conflict with the proposed plan. The following discussion, for the City of Ludington and Pere Marquette Township separately, points out these differences and proposed zoning changes.

a. City of Ludington

The proposed single and multiple family residential areas next to the municipal marina currently are zoned M-R Motel Resort District which does not permit residential use. This area should be rezoned according to the recommendations of the marina area neighborhood study.

One area on the plan is noted as Commercial/Industrial. The present Ludington zoning ordinance does not provide for mixed-commercial/industrial areas. Specific zoning for these areas should be established as either C-2 or C-3, depending on which development opportunity comes about.

Currently, there are three R1B single-family residence districts in the area shown on the plan as commercial. While these areas are in the vicinity of the marine transport zone, they are shielded by commercial development and do not present a problem to the plan. No revisions are anticipated at this time for those areas.

The marine terminal and marine transport areas on the plan are currently zoned M-2, Heavy Industry. This zoning would provide for activities at the terminal and does not need to be modified.

The Blount property (Western Concrete site) as discussed earlier would be an attractive site for seasonal condominium development or commercial development such as a hotel. To encourage this type of development, a change from existing heavy industry zoning is necessary. This area should be rezoned either M-R or R-3 depending on the type of development opportunity that comes about.

Several other small areas, such as the downtown area in the city, are zoned in another category than shown on the plan but do not present a conflict. The intent of the plan is to be flexible, allowing the character of existing areas to remain and follow natural growth trends. For this reason, the plan will be more general than the actual zoning map, to encourage compatible development in surrounding areas and particular types of port-related development.

b. Pere Marquette

The major area of conflict in Pere Marquette Township is the area currently zoned as Harbor Industry, which the plan identifies as a public use wetlands park. Zoning for this area will need to be changed to protect the area as a natural wetlands while permitting public access and compensating the owner for its use. The industrial disposal area where the lagoons are located needs to be identified separately so that its use does not conflict with the wetlands areas. It is proposed that the areas designated as wetlands park be rezoned as conservation zone.

The area south of the wetlands is designated as single family residential and is proposed to be developed as low-density single family residences (rural ranchettes). Current zoning of this area is A-2, to promote residential and agricultural development. The minimum lot size is one acre. This could be increased, up to five acres minimum size, at the Planning Commission's recommendation.

While it appears that commercial use of the Sand Products facility would require commercial zoning, in fact, when it is no longer used as a sand exporting terminal, it should be rezoned as A-2. Under section 501:4 of the Pere Marquette zoning ordinance, certain commercial uses are permitted as a conditional use.

5. Implementation Program

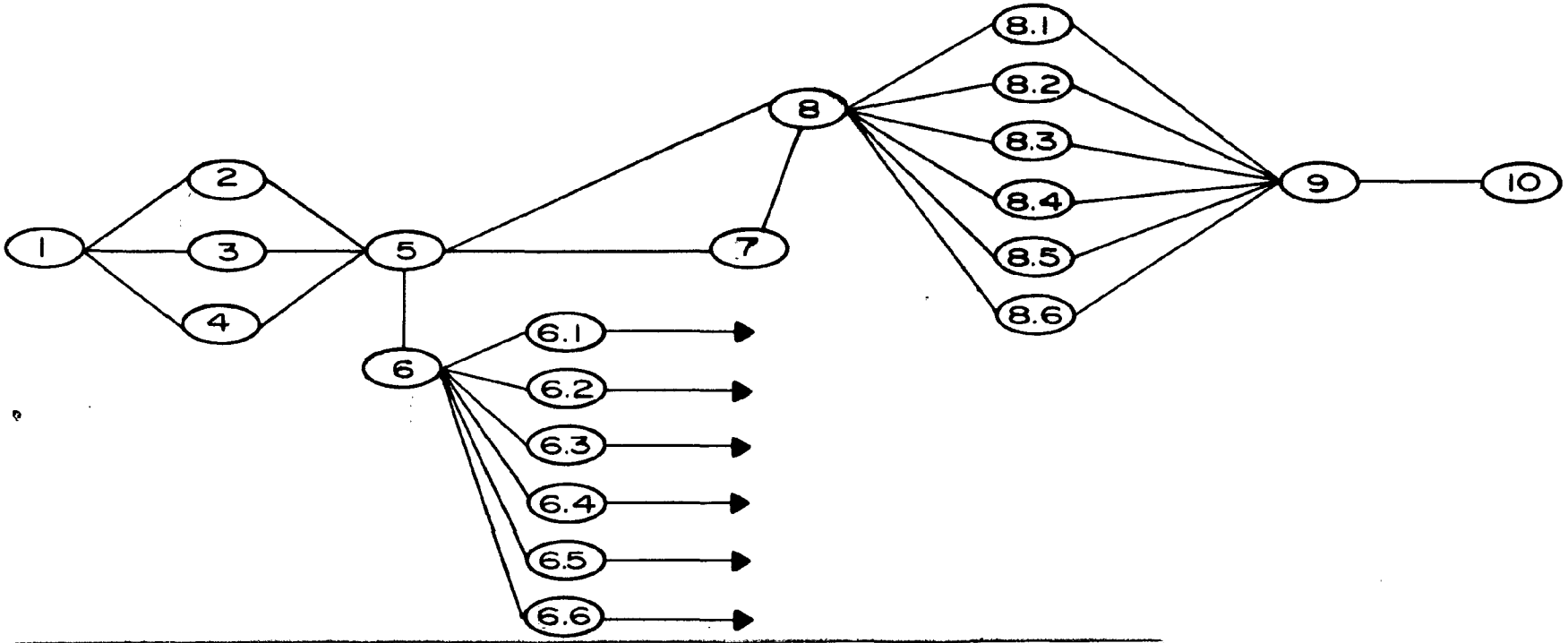
This section details the overall implementation strategy of the responsibilities of a development coordinator, a specific marketing strategy, and other implementation actions. This section provides a "road map" for implementation as seen from a fall 1982 perspective. No doubt the actual implementation will encounter some detours. Hopefully, it will also find some short cuts.

a. Overall Strategy

The overall implementation strategy is shown in Figure 37, Implementation Strategy. It shows the critical path for implementation. It begins with the Study Steering Committee's plan adoption. Next the local legislative bodies will need to consider and adopt the plan. It is anticipated that input from the local planning commission and perhaps other advisory boards will be necessary. The appointment of a lead agency for implementation follows. This agency will have on-going responsibility for plan implementation, including tasking responsibilities to other agencies. Some implementation actions may be accomplished without direct lead agency involvement. The lead agency should try to involve the private sector.

While these projects are in progress, the lead agency can be marketing the other development opportunities. A staff development coordinator would be most helpful in this task. It is anticipated that the marketing program will be an on-going effort. Likewise, each development project will move ahead at different rates through construction and into operation.

An important step in the implementation of the development opportunities will be contacting the regulatory agencies which have authority over the proposed activities. These agencies and their responsibilities are described in Section E.1., Agency Responsibilities. Those activities which involve construction of new commercial or recreational docks, dredging or filling, and other types of construction on or near the waterfront will be subject to complete review by the MDNR and U.S. Army Corps of Engineers. Regulations apply under the Michigan Inland Lakes and Streams Act and related laws regarding the amount and type of fill material which may be allowed, testing and disposal of dredged materials, etc. The proposed



1. STEERING COMMITTEE ADOPTION
2. CITY COMMISSION ADOPTION
3. TOWNSHIP BOARD ADOPTION
4. COUNTY COMMISSION ADOPTION
5. LEAD AGENCY APPOINTMENT
6. RESPONSIBILITY TASKING TO VARIOUS AGENCIES
   - 6.1 ZONING AMENDMENTS
   - 6.2 STATE/FEDERAL COORDINATION
   - 6.3 WETLANDS PARK PROJECT
   - 6.4 MARINA/RECREATION PROGRAMS
   - 6.5 FERRY OPERATIONS
   - 6.6 PERE MARQUETTE LAKE ENVIRONMENTAL PROTECTION
7. PROJECT MARKETING
8. DEVELOPMENT PLAN COMMITMENTS
   - 8.1 DRY BULK TERMINAL
   - 8.2 PETROLEUM TERMINAL
   - 8.3 OFFICE COMPLEX
   - 8.4 HOTEL COMPLEX
   - 8.5 CONDOMINIUM COMPLEX
   - 8.6 MANUFACTURING FACILITY
9. PROJECT DEVELOPMENT & CONSTRUCTION
10. OPERATIONS

Figure 37

IMPLEMENTATION STRATEGY

CITY OF LUDINGTON
PORT DEVELOPMENT STUDY

WILLIAMS & WORKS

location of recreational docking is to be reviewed by the MDNR Waterways Commission and the Michigan Department of Transportation. Local regulations of the City of Ludington, Pere Marquette Township, and Mason County will also apply.

There is a great need for good inter-agency coordination. This will have to be an on-going effort. Each member of the lead agency should be assigned a permanent responsibility for coordination with at least one other agency. This responsibility should include regular periodic meetings with the other agencies.

b. Lead Agency

A Pere Marquette Lake Commission seems to be the most viable lead agency at this time. It has several advantages in terms of local coordination, control, and environmental protection. A lake commission could form the basis of a port authority. The organization of a port authority could be effected at some later date when demand warranted or it could be organized to continue cross-lake ferry operations if the demand is sufficient. New opportunities should be monitored closely to determine as early as possible the need for a port authority.

The lake commission, or perhaps ultimately a port authority, should call upon any resource or agency for assistance in developing the plan. The agencies discussed in Section E.2 of this chapter will be particularly helpful.

Table 17 shows the annual operating budget for the Pere Marquette Lake Commission. It includes the half-time services of a development coordinator, as it is presumed that this person's responsibilities will not be limited to Pere Marquette Lake projects. While a development coordinator should not be a part-time employee, it is possible for a development coordinator to promote several projects at a time.

This budget provides a total of $6,000 for travel, advertising, and promotion. These monies are conservatively estimated and are necessary for spreading the word about Ludington.

The commissioners meeting reimbursement has been arbitrarily set at $10 per meeting. Twelve members attending 18 meetings per year are budgeted.

Table 17

Pere Marquette Lake Commission
Annual Operating Budget

Development Coordinator (1/2 time)	$12,000
Fringe Benefits	3,600
Office Space	5,000
Supplies and Postage	3,000
Travel	4,000
Advertising and Promotion	2,000
Contract Services (accounting, legal, etc.)	4,000
Commissioners Meeting Reimbursement 12 members, 18 meetings @ $10 each	2,160
Total	$35,760

c. Development Coordinator

The position of Development Coordinator is a difficult one. A solid understanding of the business world and real estate development are necessary. A development coordinator must be a "self-starter" and must meet people well. A development coordinator must combine the qualities of a salesman with those of a diplomat to make projects happen. There is no one specific set of education/experience criteria which make up a good development coordinator. The key criteria seem to be experience in getting things done and industry contacts.

The Development Coordinator should be the primary staff contact of the Lake Commission, although the Development Coordinator also works for the City Manager. It should be the responsibility of the Development Coordinator to help with all phases of a development project. Typically, this includes:

- Information Development
- Direct Marketing and Promotion
- Marketing Assistance to Realtors
- Development Proposal Review and Analysis
- Grant and Financial Assistance
- "Red-Tape" Cutting

In short, the Development Coordinator locates a developer interested in a project which is viable in Ludington, helps him make the decision to develop in Ludington, and "runs interference". Sometimes the Development Coordinator must bring together a group of divergent investors to make a project happen.

d. Marketing Strategy

There are three basic approaches to marketing development opportunities such as those identified in Chapter VIII. Each has its advantages and disadvantages and therefore the Development Coordinator must know when each is most appropriate.

One approach is to advertise the advantages or opportunities of Ludington in industry publications. This communicates these opportunities to a well-defined group of interested decision makers. Using this technique, large geographic areas and many special interest groups can be reached. This approach can be used on the local scale (daily newspapers), the state scale (major metropolitan newspapers, West Michigan Magazine, etc.) or the national scale (the Wall Street Journal, industry magazines, etc.).

A variation of this approach is to write feature articles describing the success or innovative approach of a recent project. This article should make good use of the publicity to promote other projects. Both of these approaches are inexpensive and get the information out to many people. This approach can, at best, spark some interest on the part of a developer. It is, however, a necessary step.

The second basic approach is by the use of direct contacts. These contacts should be made by both the Development Coordinator and commercial/industrial realtors. Both local and out-of-town realtors may be enlisted, on a commission basis.

To the extent possible, these contacts should be targeted toward likely prospects. Established personal relationships should be used where possible, but the "cold" contacts should not be overlooked.

Although this approach is time-consuming and, therefore, costly, it is a requirement of any sizable project. In difficult economic times it is especially necessary because it gives the Development Coordinator a chance to really sell Ludington.

The third basic approach is to solicit development proposals. Under this approach potential developers are contacted either directly or indirectly and invited to submit a proposal for developing a certain piece of property. The municipality supplies a "bid-package" of basic site information, economic data, and development potentials. The developers submit their proposals, including jobs created, tax base expanded, and required development incentives (government-backed bonds, grants, tax abatement, etc.). The municipality reviews all the proposals and selects the one which is best for the community as a whole.

This approach works best in better economic times, since it puts developers in competition with each other. In good economic times it is a very cost-effective technique. It can be held in reserve for future use.

F. RECOMMENDATIONS

This section presents the studies recommendations and their reasons. Recommendations for both the harbor expansion feasibility study and the harbor land use plan are included. No attempt has been made to prioritize these recommendations. These recommendations are based upon the work completed by the consultants, study steering committee input, the State of Michigan comments, and public input.

The recommendations that are based on future development of land that is privately owned are contingent on the availability and acquisition of that land. This study does not insure the availability or acquisition of these lands.

1. CONSIDER HEAVY INDUSTRY ONLY IF A PROPOSAL IS PRESENTED BY A SPECIFIC INDUSTRY. REVIEW DEVELOPMENT PROPOSALS AS THEY IMPACT SURROUNDING AREAS. DO NOT ACTIVELY PROMOTE HEAVY INDUSTRY.

Although the Feasibility Determination showed that certain heavy industries could be marginally feasible at Ludington, the active solicitation of these is a long and costly program. The actual development of such a facility is a "long shot" under the best of circumstances. The marginal feasibility, plus a lack of a local natural market or a local supply of raw materials, suggests that, even though such operations could be profitable at Ludington, these operations could be more profitable at other locations.

In addition to these economic problems, there are environmental and land use problems associated with these facilities. Even with the best environmental equipment, environmental problems of major consequence could cause significant public health problems. Likewise, even minor environmental problems could degrade the quality of life, thus hurting the recreation and tourism industry. In addition, the harbor layout is such that the only place for a major industrial facility is the C&O car ferry site. This site is near downtown and prime recreation/tourism areas of Ludington. It is felt that such a facility would be inappropriate. Further, it would eliminate this site's availability for the car ferry or the integrated tug barge.

2. ENCOURAGE AND AID THE CONTINUANCE OF EXISTING WATERFRONT INDUSTRIES.

The recommendation to not seek additional heavy industry should not be considered as a negative attitude toward the existing heavy industries. These industries which represent the status quo are the foundation of Ludington's economy. Since they operate year-round, they create a stabilizing influence on the area's economy.

3. ENCOURAGE AND AID THE CONTINUANCE OF EXISTING MARINE AND RECREATION RELATED COMMERCIAL, ESPECIALLY MARINAS, BOAT YARDS, HOTEL FACILITIES, AND TOURISM-ORIENTED COMMERCIAL.

Tourism and recreation are important industries to Ludington. They are proven to be successful and the new City Marina shows that the saturation point has not

yet been reached. There is a demonstrated need for additional marina berths. Pere Marquette Lake has many opportunities for recreation/tourism development, yet many industrial-tourism land use conflicts exist. Industrial and recreation/tourism can co-exist, and each be improved, with proper planning. There is reason to believe that existing recreation/tourism industries have not been optimized to take full advantage of this opportunity.

A nationally-known hotel complex would provide a magnet to draw visitors from a larger area. A year-round facility, with convention facilities, would help eliminate the slow periods. The Western Concrete site is an ideal location for a major hotel.

4. ENCOURAGE AND AID THE CONTINUANCE OF INTER-REGIONAL CROSS-LAKE RAILROAD AND PASSENGER SERVICES. EXPAND TRUCK TRANSPORT SERVICES.

The importance of inter-regional traffic to Ludington has often been stated. The McMullen Study forecasts a solid future for cross-lake rail traffic. It also forecasts a sizable cross-lake passenger volume. The importance of this passenger traffic to the recreation/tourism industry in Ludington cannot be over-emphasized. Improved trailer/truck facilities, especially timely sailings, will support area industrial growth.

Since Ludington is on the record as desiring to be the integrated tug barge home port, it follows that the Plan should give careful consideration to the needs, uses and implications of this facility.

5. ENCOURAGE AND PROMOTE WATER-RELATED, LIGHT INDUSTRIAL USES, SUCH AS PLEASURE BOAT BUILDING AND REPAIR.

This Study did not focus on the myriad of light industries that could locate in Ludington, because they generally do not need waterborne transportation. One exception to this is pleasure boat building. Medium size boat builders often locate in a community because of non-quantifiable factors such as "quality of life". Attracting such an industry, especially if coupled with a major repair facility, is a feasible objective for a city such as Ludington.

6. ENCOURAGE AND PROMOTE WATERFRONT OR NEAR-WATERFRONT DEVELOPMENT OF PROFESSIONAL OFFICES, TECHNICAL RESEARCH FACILITIES, AND THE LIKE.

Although this study did not focus on the professional office and technical research facilities at or near the waterfront, Harbor Commission input indicates a strong desire to include these uses. Historically, these uses have been successfully relocated to areas with a good quality of life rating. A waterfront or near-waterfront setting, with its choice views, can be the factor which determines where a company locates. The area behind the C&O Railroad facility and near downtown is a good location for these types of uses. The Star Watch Case facility is an ideal facility for conversion.

7. ENCOURAGE AND PROMOTE A PUBLIC BULK MATERIALS TERMINAL FOR CONSTRUCTION AGGREGATES AND A PRIVATE BULK PETROLEUM PRODUCTS TERMINAL (GASOLINE, DIESEL FUEL, HEATING OIL).

The Feasibility Determination shows the opportunity to develop a small scale public dry bulk materials terminal. The present importers of construction aggregates would benefit from an improved facility and lower operating costs.

Development of a limited facility (Phase I) is critical to the redevelopment of the North Lake and industrial area and the Western Concrete site. The use of this terminal during Phase I will be limited to inert construction aggregates only. If the market developed, then the terminal could be expanded as shown (Phase II). Any materials other than inert aggregates which are proposed for shipment through the Phase II expanded terminal must be considered for their potential environmental impacts. Certain improvements to the terminal under Phase II are anticipated, such as drainage diversion away from Pere Marquette Lake and stockpile covering to protect the lake and surrounding environment.

A bulk petroleum terminal, developed by a private entity, could serve the hinterlands of Ludington (north of Muskegon, south of Frankfort, and west of Cadillac).

8. ENCOURAGE AND SUPPORT LAKE MICHIGAN AND PERE MARQUETTE LAKE ACTIVITIES AND EVENTS WHICH DRAW TOURISTS TO THE AREA.

This recommendation is intended to support general recreation/tourism activities in the area. Organized and advertised activities draw visitors to the area. They contribute to the activities which make Ludington popular.

9. DEVELOP THE SOUTHERN PORTION OF PERE MARQUETTE LAKE FOR LOW DENSITY RESIDENTIAL WITH NON-RESIDENTIAL FACILITIES TO SUPPORT THE NEIGHBORHOOD RESIDENTS ONLY. PRESERVE THE WETLANDS IN A SUBSTANTIALLY NATURAL STATE.

Although some of the steep slopes in this area lend themselves to cluster type multi-family, there is not sufficient public infrastructure (roads, water, sewer, etc.) to support this level of development. This area, with some level areas, could be developed with large tract (about five acres) rural estates, despite the steep slopes in some places.

Any non-residential development in this area should be limited to convenience commercial, sized to serve the needs of the immediate neighborhood only. A small, limited service marina or gas dock also could be considered. Churches and schools could be considered too.

Preservation of the wetlands would be in keeping with state goals. It would provide a buffer from the Dow disposal lagoons. A nature park could also be developed.

10. A PERE MARQUETTE LAKE COMMISSION SHOULD BE ESTABLISHED AND TAKE LEAD AGENCY RESPONSIBILITY FOR PLAN IMPLEMENTATION

A Pere Marquette Lake Commission, formed from the Ludington Harbor Commission, with representatives from the City of Ludington, Pere Marquette Township, and Mason County could provide fair representation to all local governmental units concerned with Pere Marquette Lake. It would have the ability to encourage plan implementation, but through financial dependency, would be controllable.

11. ESTABLISH A PORT AUTHORITY, WHEN FUTURE NEED WARRANTS

While a port authority can be an effective implementation agency, the level of activity in the Ludington Harbor does not justify it at this time. This need could become real, however, if the C&O car ferry operation is abandoned and if it becomes feasible for the city to operate it independently. Therefore, certain initial preparations could be justified by the Lake Commission.

12. APPOINT A DEVELOPMENT COORDINATOR

A plan of this magnitude can not be implemented without the assistance of a professional staff person. Volunteers can not be expected to implement this plan without day-to-day staff assistance. The most effective marketing strategy, direct contacts, require a professional staff person who is primarily concerned with implementation and development.

13. ADOPT AND IMPLEMENT THE PLAN ACCORDING TO THE OVERALL IMPLEMENTATION STRATEGY CONTAINED IN SECTION E.5 OF THIS CHAPTER

While the details of implementation may differ from those presented herein, it is not possible to fully implement the plan without the formal support of the Ludington City Commission, the Pere Marquette Township Board, or the Mason County Board of Commissioners. Likewise, without an agency taking lead responsibility for implementation, it is not probable that the plan will be either fully implemented or implemented on a timely, economical basis.

Chapter VIII
Development Opportunities

CHAPTER VIII
DEVELOPMENT OPPORTUNITIES

INTRODUCTION

In this chapter, the results of the feasibility determination (Chapter V) are presented in the form of a development prospectus for each identified opportunity. Each prospectus contains a land development plan including a site layout. The layout shows relationships to surrounding elements and to the harbor. Site acquisition and development costs are also provided in the prospectus.

The four commercial and recreational opportunities identified are:

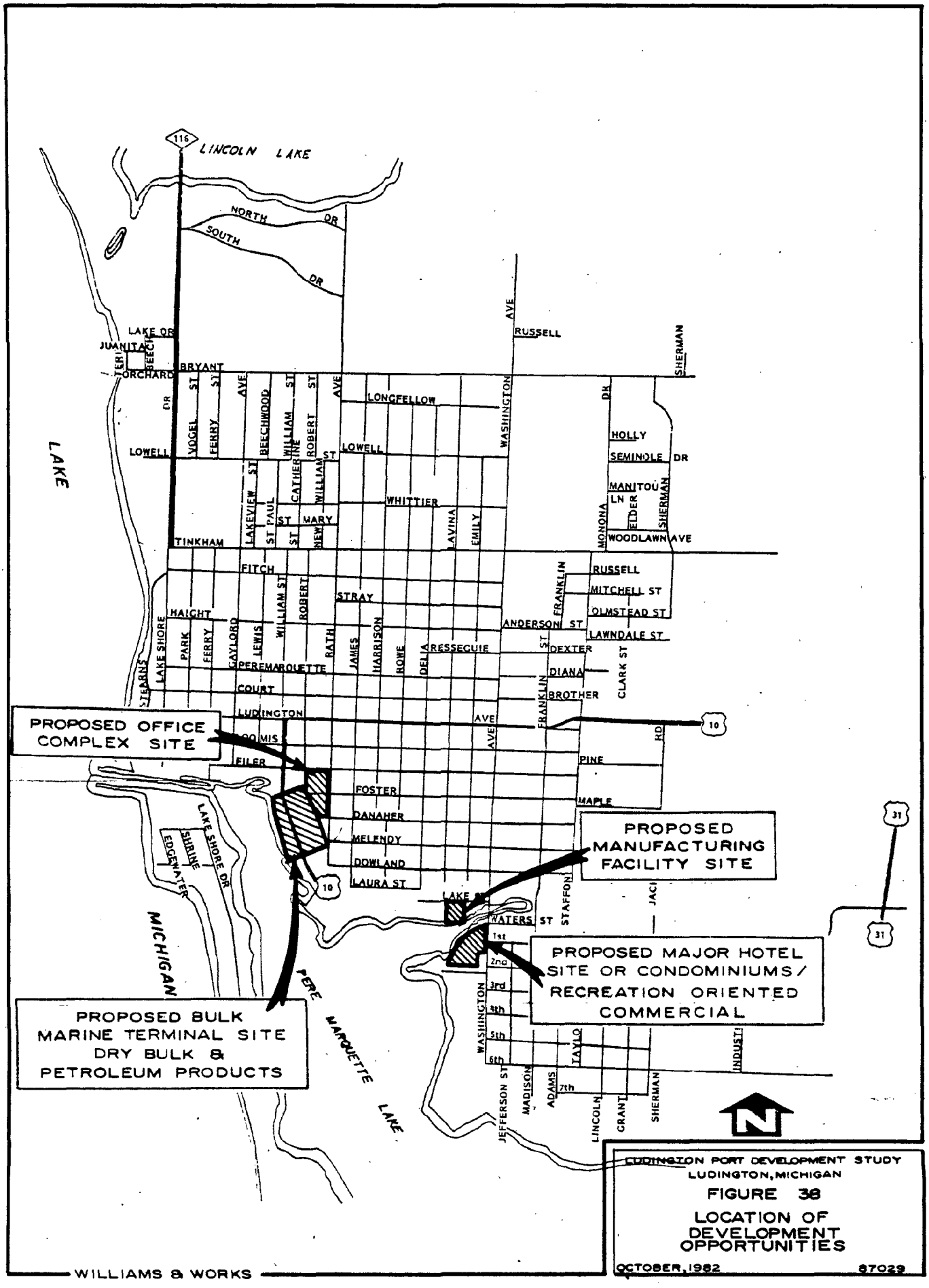
1. Major hotel
2. Condominiums and recreation-oriented commercial enterprise
3. Major office complex
4. Manufacturing facility

There are two opportunities involving shipping:

1. Bulk petroleum products terminal
2. Dry bulk terminal (construction and road maintenance materials)
    a. Phase I - initial operations (limited to inert aggregates only)
    b. Phase II - expanded future operations

Following the prospectus for the bulk terminal opportunities is a brief summary of the information gathered during contacts with the prospective shippers. This information was used to demonstrate the potential for shipping various commodities into Ludington.

The figure on the following page shows the location of the development opportunities with respect to the harbor and existing development.


PROPOSED OFFICE COMPLEX SITE
PROPOSED MANUFACTURING FACILITY SITE
PROPOSED MAJOR HOTEL SITE OR CONDOMINIUMS/ RECREATION ORIENTED COMMERCIAL
PROPOSED BULK MARINE TERMINAL SITE DRY BULK & PETROLEUM PRODUCTS
LINCOLN LAKE
LAKE MICHIGAN
PERE MARQUETTE LAKE
LUDINGTON PORT DEVELOPMENT STUDY
LUDINGTON, MICHIGAN
FIGURE 38
LOCATION OF DEVELOPMENT OPPORTUNITIES
OCTOBER, 1982
87029
WILLIAMS & WORKS

A PROSPECTUS FOR THE DEVELOPMENT OF A MAJOR HOTEL IN THE CITY OF LUDINGTON, MICHIGAN

PREPARED FOR

THE CITY OF LUDINGTON AND THE LUDINGTON HARBOR COMMISSION

— ALL INQUIRIES HELD IN STRICT CONFIDENCE —

WILLIAMS & WORKS, INC.
September, 1982

PROJECT DATA

LAND USE INFORMATION

Site Area ..... **7.4 Acres**

Land Use	Type	Area	Percent
	Hotel and Restaurant	0.8 acres	10%
	Efficiency Motel	0.3 acres	4%
	Parking and Circulation	1.3 acres	18%
	Open Space	1.7 acres	23%
	Green Belt	0.5 acres	7%
	Amenities	2.8 acres	38%
		7.4 acres	100%

Rental Units

Hotel - 14 rooms per floor times 7 floors plus 2 on first floor .... = 100 rooms

Motel - 12 rooms per floor times 2 floors, efficiency type ..... = 24 rooms

ECONOMIC INFORMATION

Acquisition Cost ..... $474,000.

Less Area to Public Space (green belt) ..... 24,000.

$450,000.

SITE IMPROVEMENT COSTS

Demolish Existing Buildings ..... 21,000.

Earthwork ..... 55,000.

Pavements and Parking ..... 90,000.

Sewers, Water, Lift Station ..... 126,000.

Green Belt (rip-rap wall) ..... 12,000.

Marina, 42 slips ..... 155,000.

CONSTRUCTION COSTS

Hotel, Resturant, Meeting Rooms ..... $5,000,000.

Enclosed Pools (2) ..... 420,000.

Motel, Efficiency Type ..... 1,000,000.

Parking and Circulation ..... 165,000.

Landscaping ..... 275,000.

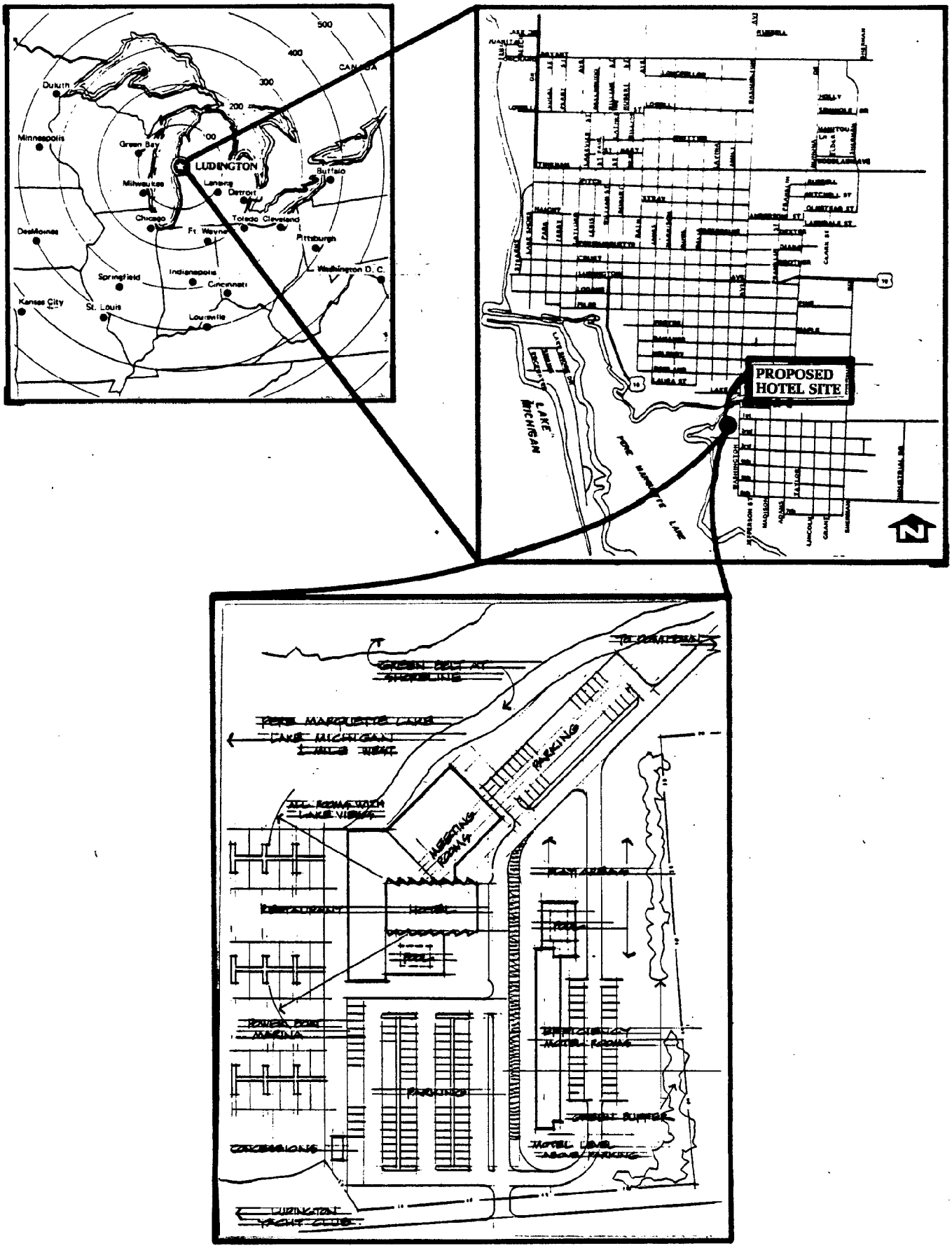
Concessions ..... 75,000.

Total Estimated Cost ..... $7,689,000.

Estimated hotel cost per square foot including resturant, meeting rooms, pool, parking, roads, underground and landscaping $68.07

Estimated motel cost per square foot including pool, parking, roads, underground, landscaping and amenities $69.04

Estimated marina cost per slip $7,524.00



TYPICAL SITE LAYOUT

PROSPECTUS OBJECTIVES:

This prospectus provides background information on the Ludington, Michigan area, Pere Marquette Lake and harbor facilities, and the proposed hotel site. This information is intended as a resource for investors seeking an attractive and profitable location for a major hotel in Michigan's western Lower Pennisula.

GENERAL BACKGROUND:

The community of Ludington, with a 1980 population of 8937, is the commercial center of Mason County. Manufacturing currently provides over 60 percent of the area's employment. Located on the eastern shores of Lake Michigan, Ludington is also a major recreational hub of the region. Sport fishing, swimming, boating, hiking, snow skiing, and snowmobiling are among the popular outdoor activities that provide year-round enjoyment for both residents and tourists.

New home construction costs in the Ludington area generally start at $60,000, while older homes are also available in favorable locations to fit various lifestyles. The West Shore Community College offers residents many special interest courses, training programs, workshops and lectures.

HARBOR FACILITIES:

Ludington has a natural deep water year-round harbor which serves a variety of commercial and recreational needs. Presently, approximately two million short tons annually are shipped through the harbor. The recently completed $5 million channel improvement project, under the guidance of the Army Corps of Engineers, has improved navigation in the port.

SITE DESCRIPTION & INFORMATION:

The land area available at the site is approximately 7.4 acres, located along the northeast shore of Pere Marquette Lake. The information inside is provided for the typical site layout shown.

BUSINESS INCENTIVES:

The construction of new commercial facilities may lead the investor to a 50% exemption from the ad valorem property tax for 12 years, while restoration of obsolete facilities may lead to a 100% exemption from ad valorem property taxes on the value of the improvements for 12 years. These incentives are provided for by Public Act 255 of 1978.

STATE BUSINESS TAXES:

Michigan overhauled its business tax structure in 1976, replacing seven separate taxes with one tax (known as the Single Business Tax). Businesses locating in Michigan, in effect, pay only 2.35% in corporate income tax in place of the previous 7.8%. New business investment is regarded under Michigan's tax laws with an immediate 100% write-off for all new personal property capital investments. Michigan is one of only sixteen states that do not levy a tax on inventories.

TAX RATE:

In Ludington and Pere Marquette Township the 1981 tax rate per $1,000 of equalized valuation is divided as follows:

Ludington:		**Pere Marquette Township:**	
City	20.000	Township	1.000
School	19.300	School	19.300
County	4.876	County	4.876
Special Voted	3.799	Special Voted	3.799

INFORMATION SERVICES:

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City Manager
City of Ludington
Municipal Bldg.
Ludington, MI 49431
PH: (616)845-6231

Township Supervisor
Pere Marquette Twp. Hall
1671 S. Pere Marquette Rd.
Ludington, MI 49431
PH: (616)845-1277

Development Coordinator
Mason County Bldg.
Ludington, MI 49431
PH: (616)845-5407

ALL INFORMATION SERVICES PROVIDED AT NO COST TO POTENTIAL INVESTORS. YOUR INQUIRY WILL BE PROCESSED IN COMPLETE PROFESSIONAL CONFIDENCE.

A PROSPECTUS FOR CONDOMINIUMS AND RECREATION ORIENTED COMMERCIAL DEVELOPMENT IN THE CITY OF LUDINGTON, MICHIGAN

PREPARED FOR

THE CITY OF LUDINGTON AND THE LUDINGTON HARBOR COMMISSION

— ALL INQUIRIES HELD IN STRICT CONFIDENCE —

WILLIAMS & WORKS, INC.
September, 1982

PROJECT DATA

LAND USE INFORMATION

Site Area ..... **7.4 Acres**

Land Use	Type	Area	Percent
	Residential	0.7 acres	19 %
	Community Buildings	0.4 acres	5 %
	Parking and Circulation	1.3 acres	18 %
	Amenities	0.1 acres	1 %
	Open Space	3.7 acres	41 %
	Green Belt	1.2 acres	16 %
		7.4 acres	100 %

Density	48 total dwelling units 6.5 dwelling units per gross acre
Dwelling Units	Units: 2 story condominium garden apartment Each apartment: 1250 square feet with 2 bedrooms

ECONOMIC INFORMATION

Acquisition Cost ..... $474,000.
Less area to public space (green belt) ..... 76,000.
$398,000.

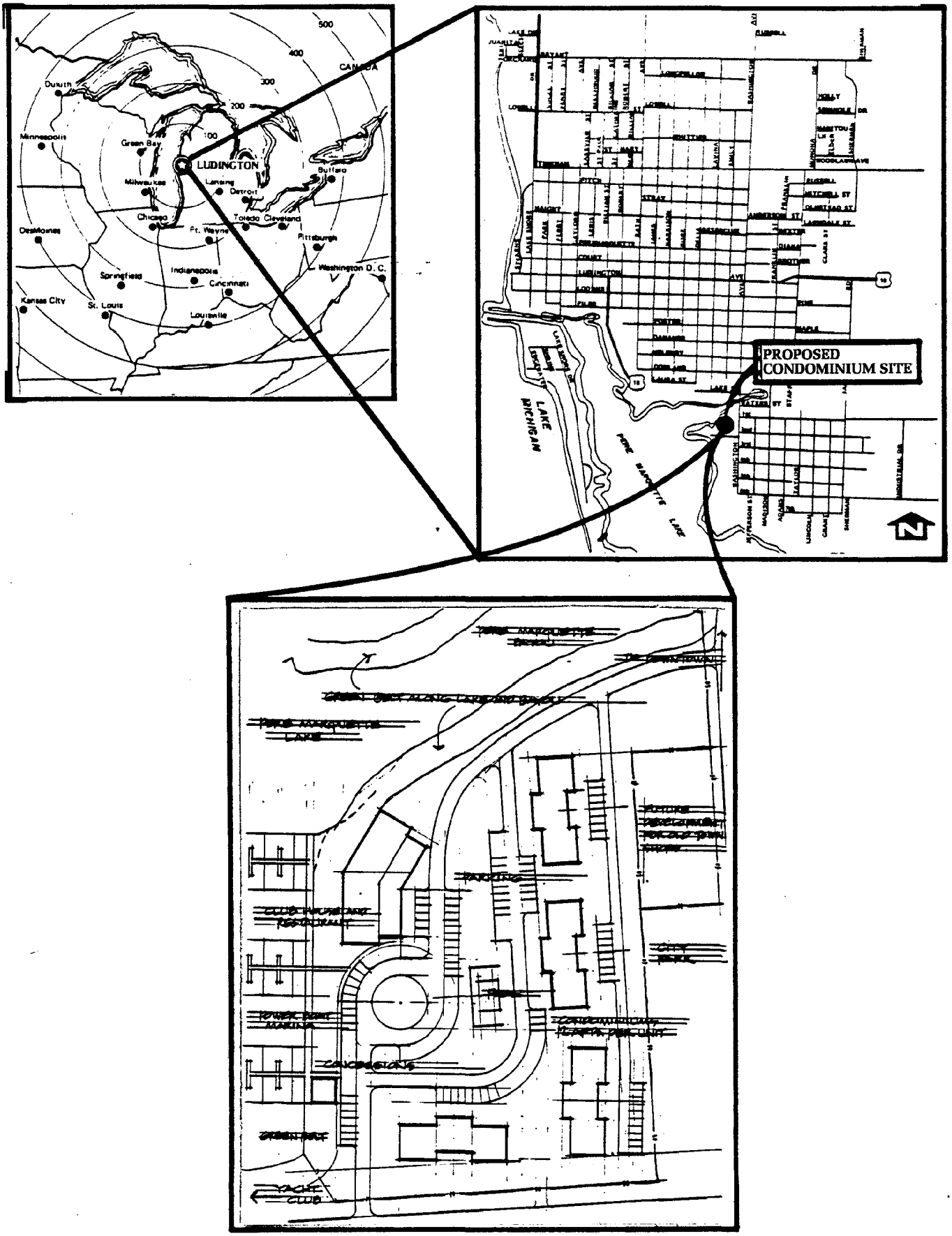
SITE IMPROVEMENT COSTS

Demolish Existing Buildings ..... 21,000.
Earthwork ..... 55,000.
Pavements and Parking ..... 100,000.
Sewers, water, lift station ..... 141,000.
Green Belt, Rip Rap Wall ..... 32,000.
Marina, 30 Slips ..... 111,000.

CONSTRUCTION COSTS

Condominiums ..... $2,400,000.
Clubhouse and Restaurant ..... 1,128,000.
Parking and Circulation ..... 165,000.
Landscaping, pool ..... 302,000.
Concessions ..... 75,000.
Total Estimated Cost ..... $4,817,000.

Estimated condominium cost per square foot
(including parking, roads, underground, landscaping) $46.12
Estimated clubhouse cost per square foot
(including parking, roads, underground, landscaping) $87.88
Estimated marina cost per slip ..... $8,370.
Estimated condominium dwelling unit cost ..... $57,645.



TYPICAL SITE LAYOUT

PROSPECTUS OBJECTIVES:

This prospectus provides background information on the Ludington, Michigan area, Pere Marquette Lake and harbor facilities, and the proposed condominium location. This information is intended as a resource for investors seeking an attractive residential and recreational development site in Michigan's western Lower Pennisula.

GENERAL BACKGROUND:

The community of Ludington, with a 1980 population of 8937, is the commercial center of Mason County. Manufacturing currently provides over 60 percent of the area's employment. Located on the eastern shores of Lake Michigan, Ludington is also a major recreational hub of the region. Sport fishing, swimming, boating, hiking, snow skiing, and snowmobiling are among the popular outdoor activities that provide year-round enjoyment for both residents and tourists.

New home construction costs in the Ludington area generally start at $60,000, while older homes are also available in favorable locations to fit various lifestyles. The West Shore Community College offers residents many special interest courses, training programs, workshops and lectures.

HARBOR FACILITIES:

Ludington has a natural deep water year-round harbor which serves a variety of commercial and recreational needs. Presently, approximately two million short tons annually are shipped through the harbor. The recently completed $5 million channel improvement project, under the guidance of the Army Corps of Engineers, has improved navigation in the port.

SITE DESCRIPTION & INFORMATION:

The land area available at the site is approximately 7.4 acres, located along the northeast shore of Pere Marquette Lake. The information inside is provided for the typical site layout shown.

BUSINESS INCENTIVES:

The construction of new commercial facilities may lead the investor to a 50% exemption from the ad valorem property tax for 12 years, while restoration of obsolete facilities may lead to a 100% exemption from ad valorem property taxes on the value of the improvements for 12 years. These incentives are provided for by Public Act 255 of 1978.

STATE BUSINESS TAXES:

Michigan overhauled its business tax structure in 1976, replacing seven separate taxes with one tax (known as the Single Business Tax). Businesses locating in Michigan, in effect, pay only 2.35% in corporate income tax in place of the previous 7.8%. New business investment is regarded under Michigan's tax laws with an immediate 100% write-off for all new personal property capital investments. Michigan is one of only sixteen states that do not levy a tax on inventories.

TAX RATE:

In Ludington and Pere Marquette Township the 1981 tax rate per $1,000 of equalized valuation is divided as follows:

Ludington:		**Pere Marquette Township:**	
City	20.000	Township	1.000
School	19.300	School	19.300
County	4.876	County	4.876
Special Voted	3.799	Special Voted	3.799

INFORMATION SERVICES:

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1671 S. Pere Marquette Rd.
Ludington, MI 49431
PH: (616)845-1277

Development Coordinator
Mason County Bldg.
Ludington, MI 49431
PH: (616)845-5407

ALL INFORMATION SERVICES PROVIDED AT NO COST TO POTENTIAL INVESTORS. YOUR INQUIRY WILL BE PROCESSED IN COMPLETE PROFESSIONAL CONFIDENCE.

A PROSPECTUS FOR THE DEVELOPMENT OF A MAJOR OFFICE COMPLEX IN THE CITY OF LUDINGTON, MICHIGAN

PREPARED FOR

THE CITY OF LUDINGTON AND THE LUDINGTON HARBOR COMMISSION

— ALL INQUIRIES HELD IN STRICT CONFIDENCE —

WILLIAMS & WORKS, INC.
September, 1982

PROJECT DATA

LAND USE INFORMATION

Site Area ..... **4.5 Acres**

Land Use	Type	Square Feet	Area	Percent
	Offices (three floors)	33,300	0.8 acres	18%
	Hotel	15,600	0.4 acres	9%
	Restaurant	9,200	0.2 acres	5%
	Parking and Circulation	90,120	2.1 acres	44%
	Amenities	47,800	1.1 acres	24%
			4.5 acres	100%

ECONOMIC INFORMATION

Acquisition Cost ..... $307,000.

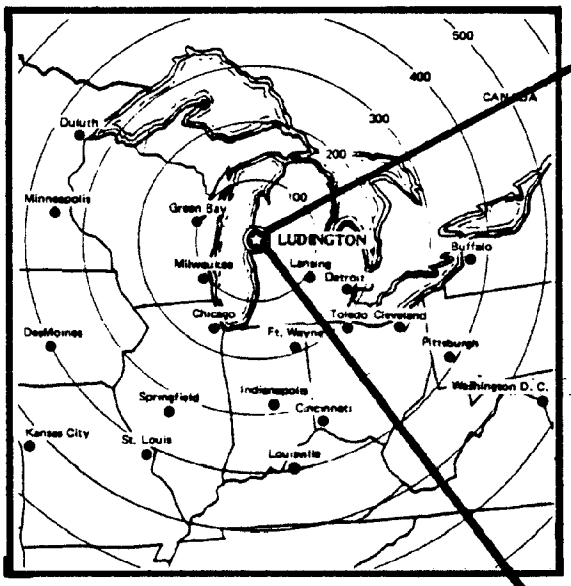
SITE IMPROVEMENT COSTS

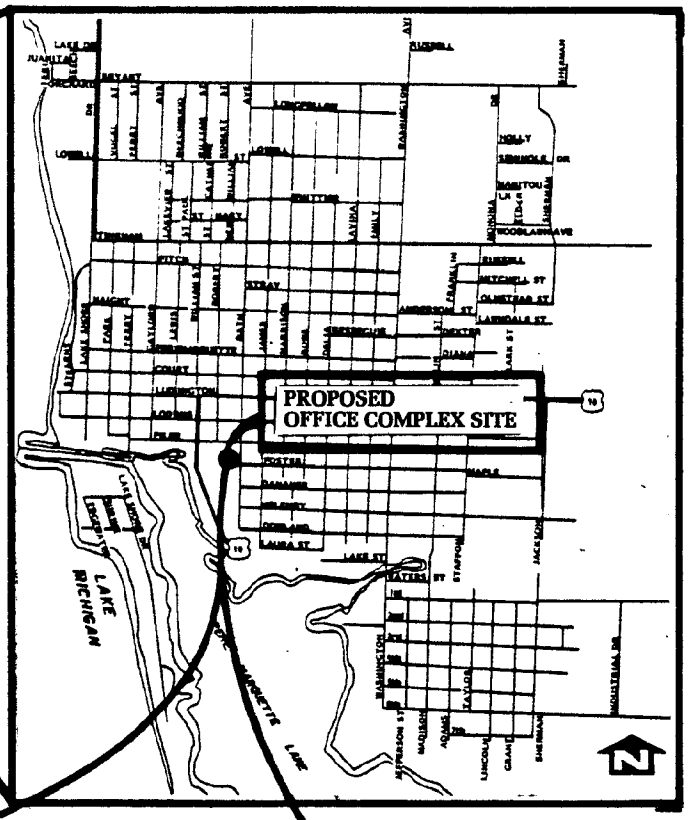
Demolish Existing Factory Buildings ..... 105,000.
Demolish Existing Houses 20,000
Earthwork ..... 3,000.
New Street Work ..... 35,000.
New Sewers, Water ..... 25,000.

CONSTRUCTION COSTS

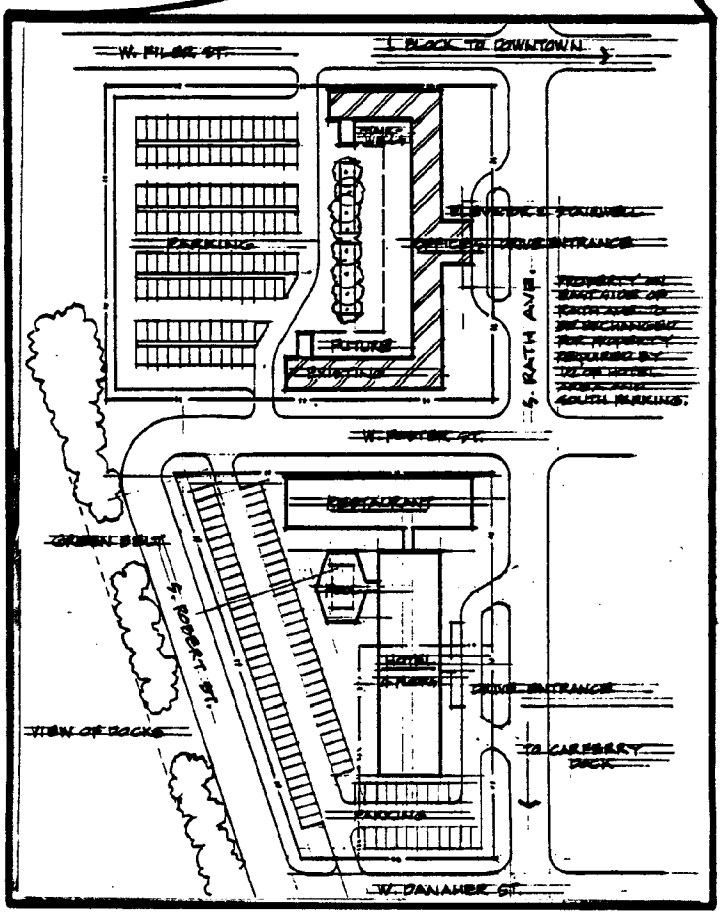
Offices ..... $3,497,000.
Hotel ..... 4,278,000.
Restaurant ..... 800,000.
Parking and Circulation ..... 450,000.
Landscaping ..... 80,000.
Total Estimated Cost ..... $9,600,000.

Hotel and Restaurant $5,508,000
Offices $4,092,000
Estimated new hotel cost per square foot including parking, restaurant, and amenities $75.57
Estimated remodeling building cost per square foot including parking and amenities $40.96





Ludington's northcentral location makes midwest markets easily assessible.



TYPICAL SITE LAYOUT

PROSPECTUS OBJECTIVES:

This prospectus provides background information on the Ludington, Michigan area, Pere Marquette Lake and harbor facilities, and the proposed office complex site. This information is intended as a resource for investors seeking an attractive and profitable office location in Michigan's western Lower Pennisula.

GENERAL BACKGROUND:

The community of Ludington, with a 1980 population of 8937, is the commercial center of Mason County. Manufacturing currently provides over 60 percent of the area's employment. Located on the eastern shores of Lake Michigan, Ludington is also a major recreational hub of the region. Sport fishing, swimming, boating, hiking, snow skiing, and snowmobiling are among the popular outdoor activities that provide year-round enjoyment for both residents and tourists.

New home construction costs in the Ludington area generally start at $60,000, while older homes are also available in favorable locations to fit various lifestyles. The West Shore Community College offers residents many special interest courses, training programs, workshops and lectures.

HARBOR FACILITIES:

Ludington has a natural deep water year-round harbor which serves a variety of commercial and recreational needs. Presently, approximately two million short tons annually are shipped through the harbor. The recently completed $5 million channel improvement project, under the guidance of the Army Corps of Engineers, has improved navigation in the port.

SITE DESCRIPTION & INFORMATION:

The land area available at the site is approximately 4.5 acres, located along the northeast shore of Pere Marquette Lake. The information inside is provided for the typical site layout shown.

BUSINESS INCENTIVES:

The construction of new commercial facilities may lead the investor to a 50% exemption from the ad valorem property tax for 12 years, while restoration of obsolete facilities may lead to a 100% exemption from ad valorem property taxes on the value of the improvements for 12 years. These incentives are provided for by Public Act 255 of 1978.

STATE BUSINESS TAXES:

Michigan overhauled its business tax structure in 1976, replacing seven separate taxes with one tax (known as the Single Business Tax). Businesses locating in Michigan, in effect, pay only 2.35% in corporate income tax in place of the previous 7.8%. New business investment is regarded under Michigan's tax laws with an immediate 100% write-off for all new personal property capital investments. Michigan is one of only sixteen states that do not levy a tax on inventories.

TAX RATE:

In Ludington and Pere Marquette Township the 1981 tax rate per $1,000 of equalized valuation is divided as follows:

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Special Voted	3.799	Special Voted	3.799

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Development Coordinator
Mason County Bldg.
Ludington, MI 49431
PH: (616)845-5407

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A PROSPECTUS FOR THE DEVELOPMENT OF A MANUFACTURING FACILITY IN THE CITY OF LUDINGTON, MICHIGAN

PREPARED FOR

THE CITY OF LUDINGTON AND THE LUDINGTON HARBOR COMMISSION

— ALL INQUIRIES HELD IN STRICT CONFIDENCE —

WILLIAMS & WORKS, INC.
September, 1982

PROJECT DATA

LAND USE INFORMATION

Site Area ..... **6.0 Acres**

Land Use	Type	Area	Percent
	Industrial	4.5 acres	75 %
	Open Space	0.8 acres	13 %
	Public Streets	0.7 acres	12 %
		6.0 acres	100 %

ECONOMIC INFORMATION

Acquisition Cost	$346,000.
Less Area to Public Space	86,000.
	$260,000.

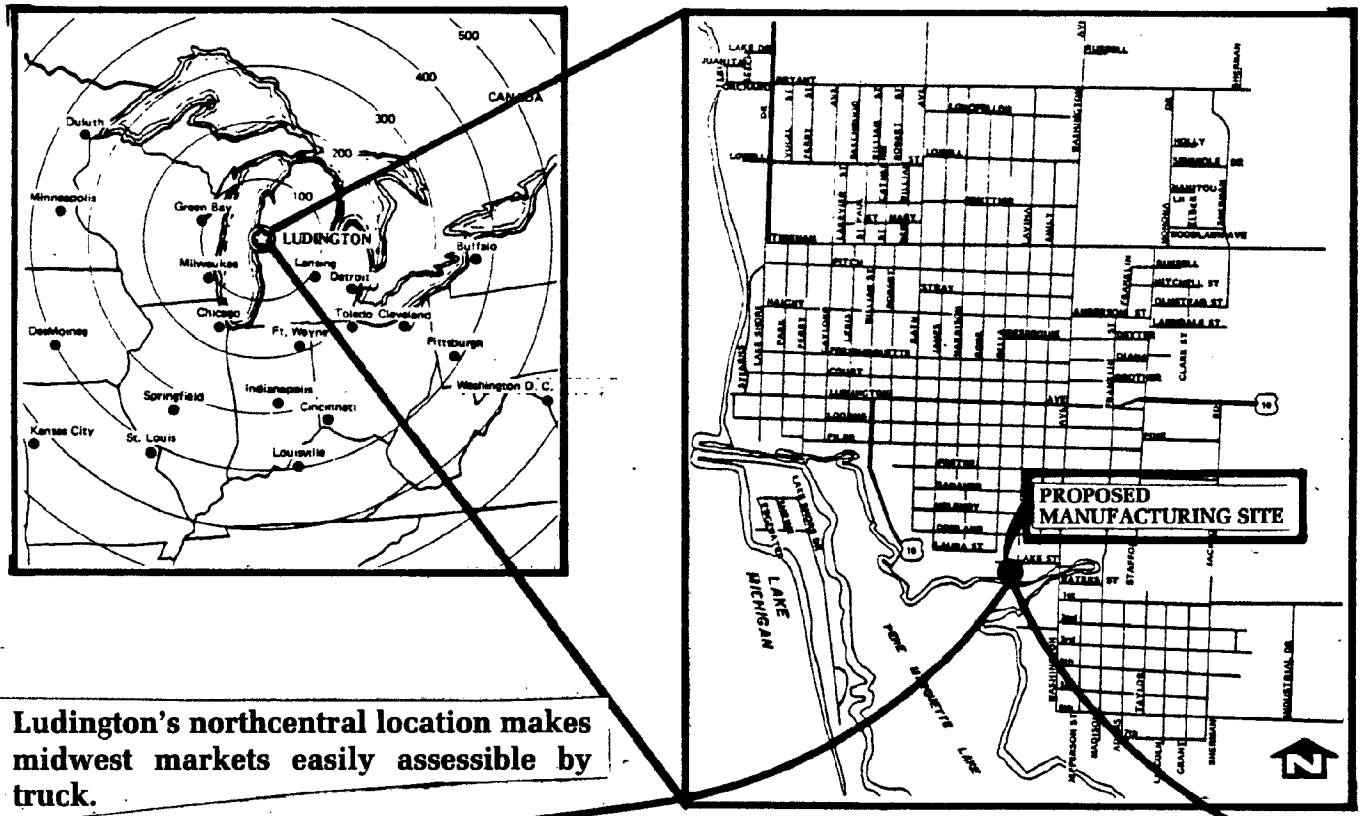
SITE IMPROVEMENT COSTS

Demolish Existing Buildings	68,000.
Earthwork	7,000.
Relocated Street	45,000.
Relocated Sewers, Water	48,000.
Green Belt (rip-rap wall)	32,000.

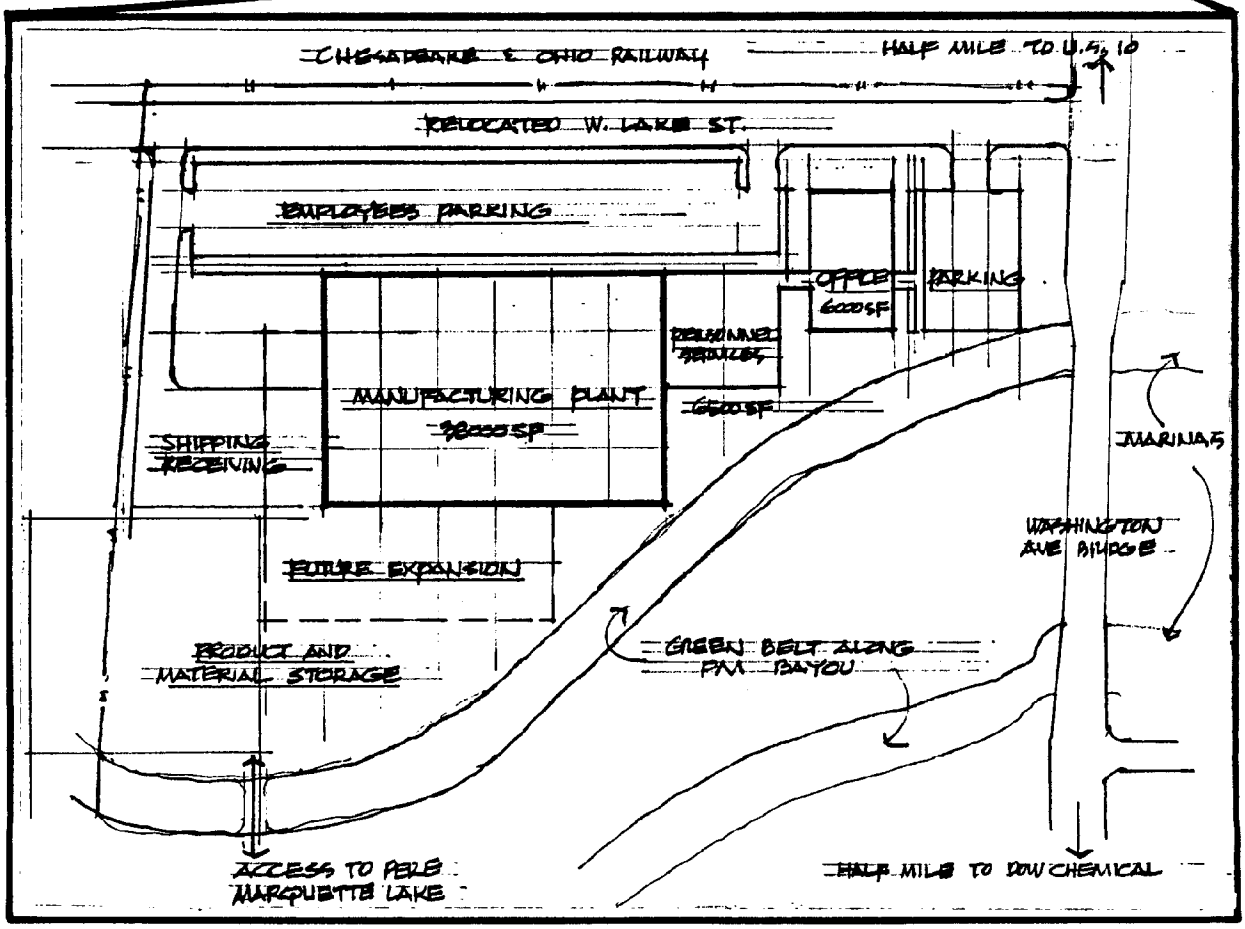
CONSTRUCTION COSTS

Manufacturing Plant	$1,330,000.
Offices	318,000.
Service Facilities	422,000.
Parking and Walks	192,000.
Landscaping, Fencing	150,000.
Total Estimated Cost	$2,872,000.

Estimated Building Cost per square foot	$40.99
Estimated Amenities Cost per square foot of building	$ 7.41
Estimated Public Service Cost per square foot of building	$ 4.79
Estimated Land Cost per square foot of building	$ 5.15



Ludington's northcentral location makes midwest markets easily assessible by truck.



TYPICAL SITE LAYOUT

PROSPECTUS OBJECTIVES:

This prospectus provides background information on the Ludington, Michigan area, Pere Marquette Lake and harbor facilities, and the proposed light-duty manufacturing site. This information is intended as a resource for investors seeking an attractive and profitable manufacturing site in Michigan's western Lower Pennisula.

GENERAL BACKGROUND:

The community of Ludington, with a 1980 population of 8937, is the commercial center of Mason County. Manufacturing currently provides over 60 percent of the area's employment. Located on the eastern shores of Lake Michigan, Ludington is also a major recreational hub of the region. Sport fishing, swimming, boating, hiking, snow skiing, and snowmobiling are among the popular outdoor activities that provide year-round enjoyment for both residents and tourists.

New home construction costs in the Ludington area generally start at $60,000, while older homes are also available in favorable locations to fit various lifestyles. The West Shore Community College offers residents many special interest courses, training programs, workshops and lectures.

HARBOR FACILITIES:

Ludingtion has a natural deep water year-round harbor which serves a variety of commercial and recreational needs. Presently, approximately two million short tons annually are shipped through the harbor. The recently completed $5 million channel improvement project, under the guidance of the Army Corps of Engineers, has improved navigation in the port.

SITE DESCRIPTION & INFORMATION:

The land area available at the site is approximately 6 acres, located along the northeast shore of Pere Marquette Lake. The information inside is provided for the typical site layout shown.

BUSINESS INCENTIVES:

Construction of a new manufacturing facility could lead the investor to a tax saving equivalent to 50% of the ad valorem property tax for 12 years. Property, such as land improvements, buildings and structures, whether leased or owned, personal property, including machinery, equipment, furniture and fixtures would be eligible. Land and inventories are excluded. This incentive is provided by Public Act 198 of 1974.

STATE BUSINESS TAXES:

Michigan overhauled its business tax structure in 1976, replacing seven separate taxes with one tax (known as the Single Business Tax). Businesses locating in Michigan, in effect, pay only 2.35% in corporate income tax in place of the previous 7.8%. New business investment is regarded under Michigan's tax laws with an immediate 100% write-off for all new personal property capital investments. Michigan is one of only sixteen states that do not levy a tax on inventories.

TAX RATE:

In Ludington and Pere Marquette Township the 1981 tax rate per $1,000 of equalized valuation is divided as follows:

Ludington:		**Pere Marquette Township:**	
City	20.000	Township	1.000
School	19.300	School	19.300
County	4.876	County	4.876
Special Voted	3.799	Special Voted	3.799

INFORMATION SERVICES:

For any of your informational services, please contact by phone or outline your needs and mail to one of the following:

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Development Coordinator
Mason County Bldg.
Ludington, MI 49431
PH: (616)845-5407

ALL INFORMATION SERVICES PROVIDED AT NO COST TO POTENTIAL INVESTORS. YOUR INQUIRY WILL BE PROCESSED IN COMPLETE PROFESSIONAL CONFIDENCE.

A PROSPECTUS FOR THE DEVELOPMENT OF A MARINE PETROLEUM BULK TERMINAL IN THE CITY OF LUDINGTON, MICHIGAN

PREPARED FOR

THE CITY OF LUDINGTON AND THE LUDINGTON HARBOR COMMISSION

— ALL INQUIRIES HELD IN STRICT CONFIDENCE —

WILLIAMS & WORKS, INC.
September, 1982

PROJECT DATA

LAND USE INFORMATION

Site Area ..... **13.8 Acres**

Land Use	Type	Area	Percent
	Bulk Storage	4.5 acres	32 %
	Office and Facilities	1.9 acres	14 %
	Public Street	0.9 acres	6 %
	Green Belt	6.5 acres	48 %
		13.8 acres	100 %

ECONOMIC INFORMATION

Acquisition Cost (approximate) ..... $300,000.

SITE IMPROVEMENT COSTS

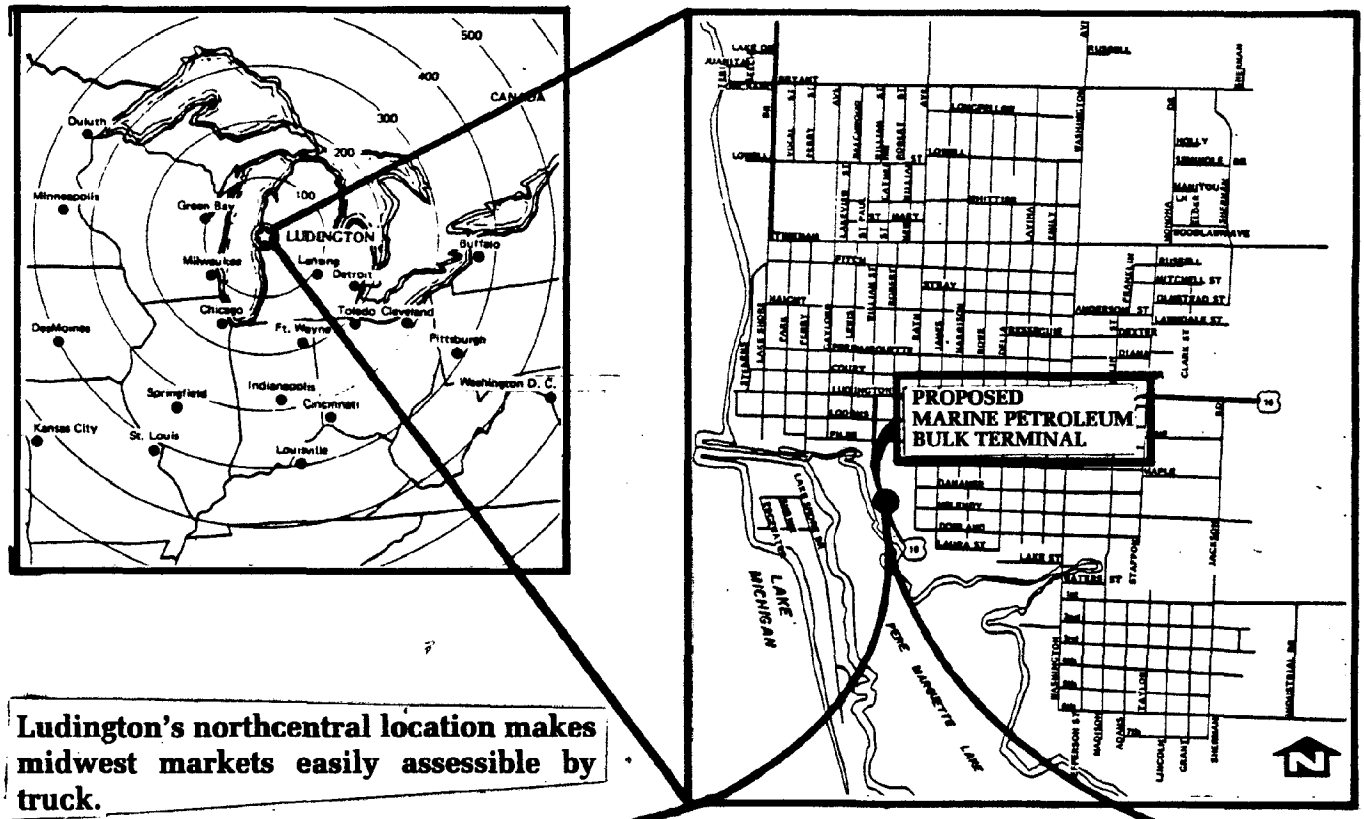
New Street ..... 90,000.
Sewer and Water ..... 48,000.
Dock Face Improvements ..... 60,000.

CONSTRUCTION COSTS

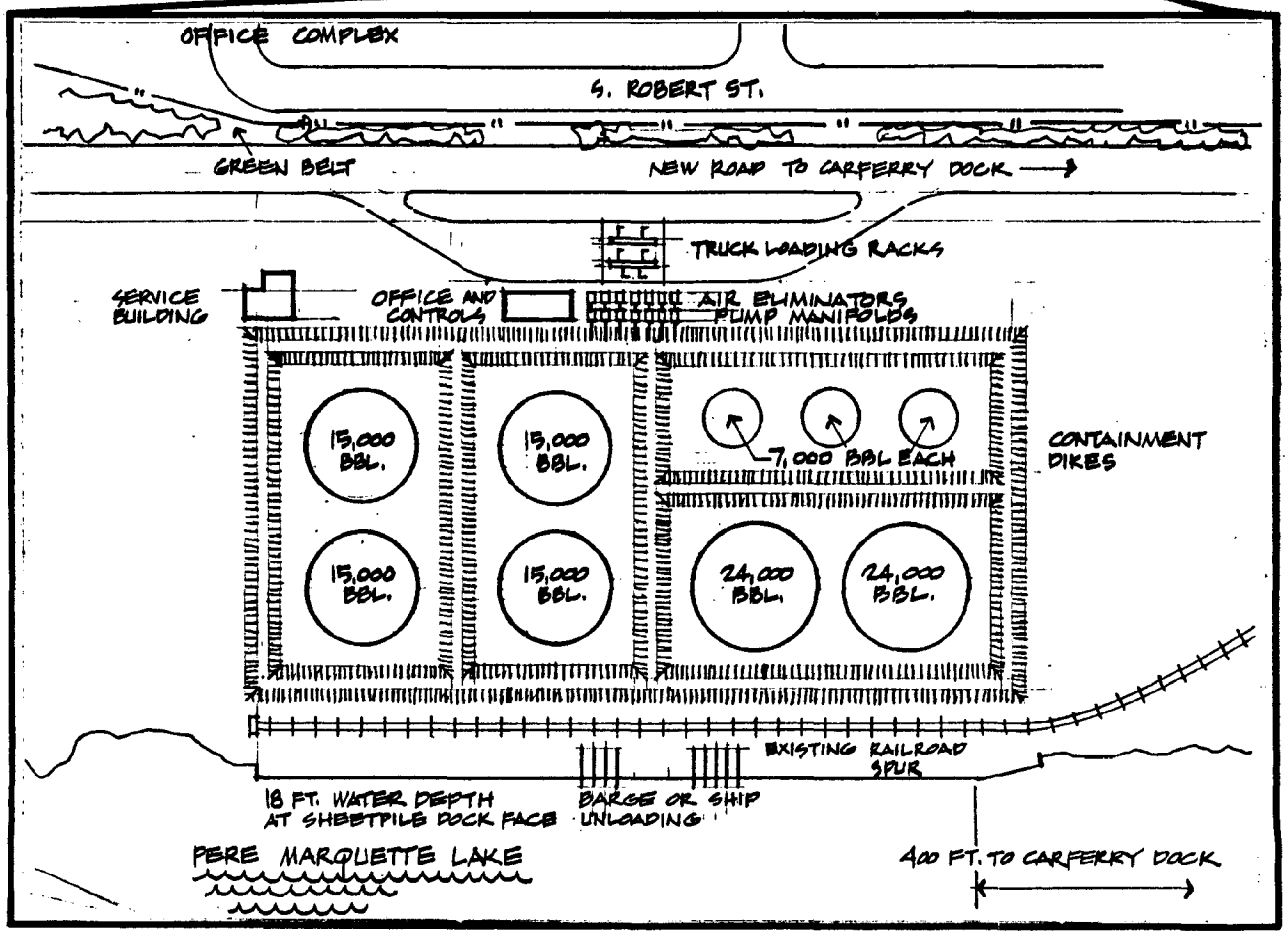
Office ..... $78,000.
Service Building ..... 48,000.
Parking and Loading Area ..... 89,000.
Overhead Truck Loading Equipment ..... 40,000.
Tanks and Appurtenances ..... 2,525,000.
Tank Foundations ..... 875,000.
Earthwork (dikes) ..... 42,000.
Piping and Pumps ..... 104,000.
Metering and Miscellaneous Equipment ..... 30,000.
Fencing ..... 38,000.
Foam Extinguishing System ..... 40,000.
Total Estimated Cost ..... $4,407,000.

ANNUAL OPERATING COST ESTIMATE

Administration ..... 50,000.
Labor ..... 60,000.
Retirement of Development Costs (20 years at 13 %) ..... 627,000.
Operating Expenses (supplies and equipment) ..... 20,000.
Utilities ..... 25,000.
Annual Estimated Operating Costs ..... $782,000.
Operating costs per gallon for
18,700,000 gallons annually $0.042



Ludington's northcentral location makes midwest markets easily assessible by truck.



TYPICAL SITE LAYOUT

PROSPECTUS OBJECTIVES:

This prospectus provides background information on the Ludington, Michigan area, Pere Marquette Lake and harbor facilities, and the proposed bulk marine terminal location. This information is intended as a resource for investors seeking a profitable marine petroleum terminal site in Michigan's western Lower Pennisula.

GENERAL BACKGROUND:

The community of Ludington, with a 1980 population of 8937, is the commercial center of Mason County. Manufacturing currently provides over 60 percent of the area's employment. Located on the eastern shores of Lake Michigan, Ludington is also a major recreational hub of the region. Sport fishing, swimming, boating, hiking, snow skiing, and snowmobiling are among the popular outdoor activities that provide year-round enjoyment for both residents and tourists.

New home construction costs in the Ludington area generally start at $60,000, while older homes are also available in favorable locations to fit various lifestyles. The West Shore Community College offers residents many special interest courses, training programs, workshops and lectures.

HARBOR FACILITIES:

Ludingtion has a natural deep water year-round harbor which serves a variety of commercial and recreational needs. Presently, approximately two million short tons annually are shipped through the harbor. The recently completed $5 million channel improvement project, under the guidance of the Army Corps of Engineers, has improved navigation in the port.

SITE DESCRIPTION & INFORMATION:

The land area available at the site is approximately 13.8 acres, located along the northeast shore of Pere Marquette Lake. The information inside is provided for the typical site layout shown.

BUSINESS INCENTIVES:

The construction of new commercial facilities may lead the investor to a 50% exemption from the ad valorem property tax for 12 years, while restoration of obsolete facilities may lead to a 100% exemption from ad valorem property taxes on the value of the improvements for 12 years. These incentives are provided for by Public Act 255 of 1978.

STATE BUSINESS TAXES:

Michigan overhauled its business tax structure in 1976, replacing seven separate taxes with one tax (known as the Single Business Tax). Businesses locating in Michigan, in effect, pay only 2.35% in corporate income tax in place of the previous 7.8%. New business investment is regarded under Michigan's tax laws with an immediate 100% write-off for all new personal property capital investments. Michigan is one of only sixteen states that do not levy a tax on inventories.

TAX RATE:

In Ludington and Pere Marquette Township the 1981 tax rate per $1,000 of equalized valuation is divided as follows:

Ludington:		**Pere Marquette Township:**	
City	20.000	Township	1.000
School	19.300	School	19.300
County	4.876	County	4.876
Special Voted	3.799	Special Voted	3.799

INFORMATION SERVICES:

For any of your informational services, please contact by phone or outline your needs and mail to one of the following:

City Manager
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Ludington, MI 49431
PH: (616)845-6231

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Development Coordinator
Mason County Bldg.
Ludington, MI 49431
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COMMODITY DATA

Results of Bulk Shipping Terminal Contacts for Bulk Petroleum Terminal

Summary

A number of contacts were made with local distributors (jobbers), regional distributors, oil company representatives, professional organizations, and bulk users of petroleum products. Most contacts reported that a marine petroleum terminal would typically be developed by a major distributor or an oil company, and thus public ownership would not be likely (although land could be leased). Most contacts reported that a thorough and detailed feasibility study would be necessary prior to consideration of this type of investment. The petroleum distribution business is highly competitive; thus, rates, transportation costs, terminal fees, and profits were not revealed.

A PROSPECTUS FOR THE DEVELOPMENT OF A – PHASE I OPERATION – MARINE DRY BULK TERMINAL IN THE CITY OF LUDINGTON, MICHIGAN

PREPARED FOR

THE CITY OF LUDINGTON AND THE LUDINGTON HARBOR COMMISSION

— ALL INQUIRIES HELD IN STRICT CONFIDENCE —

WILLIAMS & WORKS, INC.
September, 1982

PROJECT DATA

LAND USE INFORMATION

Site Area ..... **2.5 Acres**

Land Use	Type	Area	Percent
	Railroad	0.3 acres	12 %
	Open Stockpile	0.6 acres	24 %
	Open Space	1.6 acres	64 %
		2.5 acres	100 %

ECONOMIC INFORMATION

Dock Improvements

Replace One Mooring Bollard ..... $1,000.
Repair 25 Feet of Steel Sheetpile cap ..... 500.
Upgrade Existing Fender ..... 500.
$2,000.

ANNUAL OPERATING COST ESTIMATE

Administration Costs ..... 2,000.

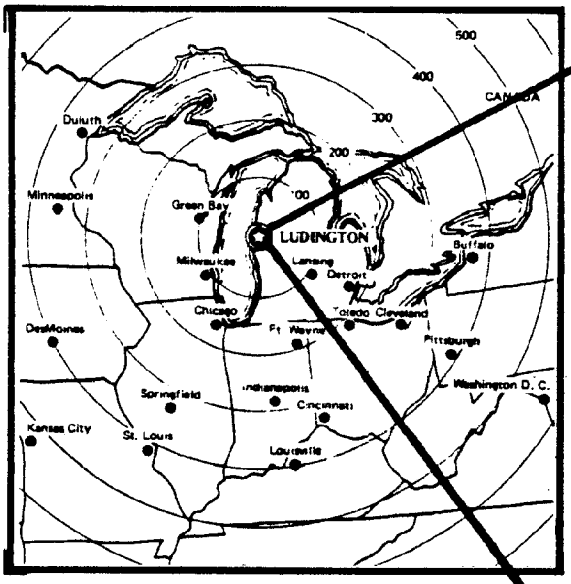
Maintenence and Upkeep of Dock Face (labor and materials) ..... 1,000.

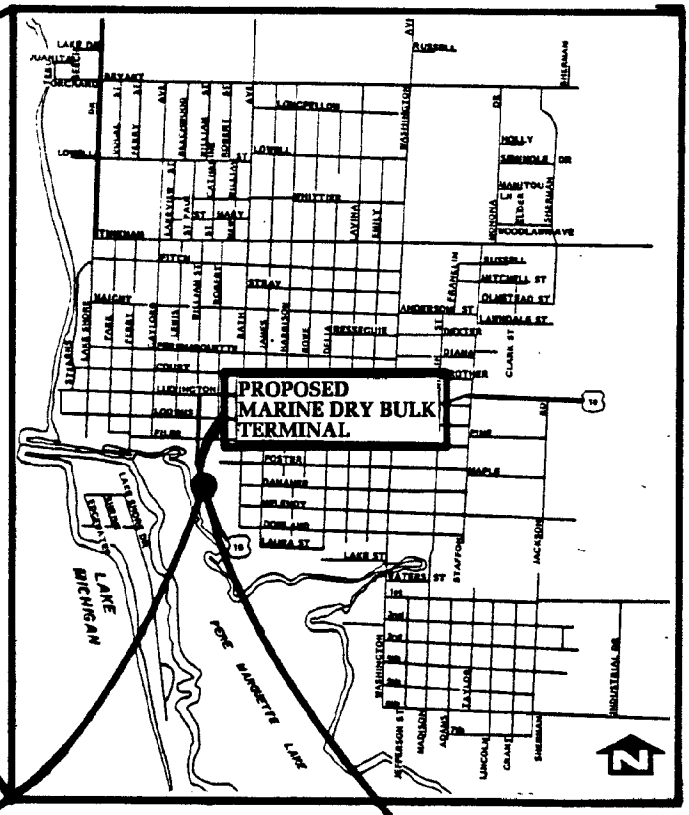
Retirement of Dock Improvement Costs (10 years at 13 %) ..... 370.

Property Rental Costs from C&O Railaroad
(assessed at $0.50/ton for an estimated 12,000 tons annually) ..... 6,000.

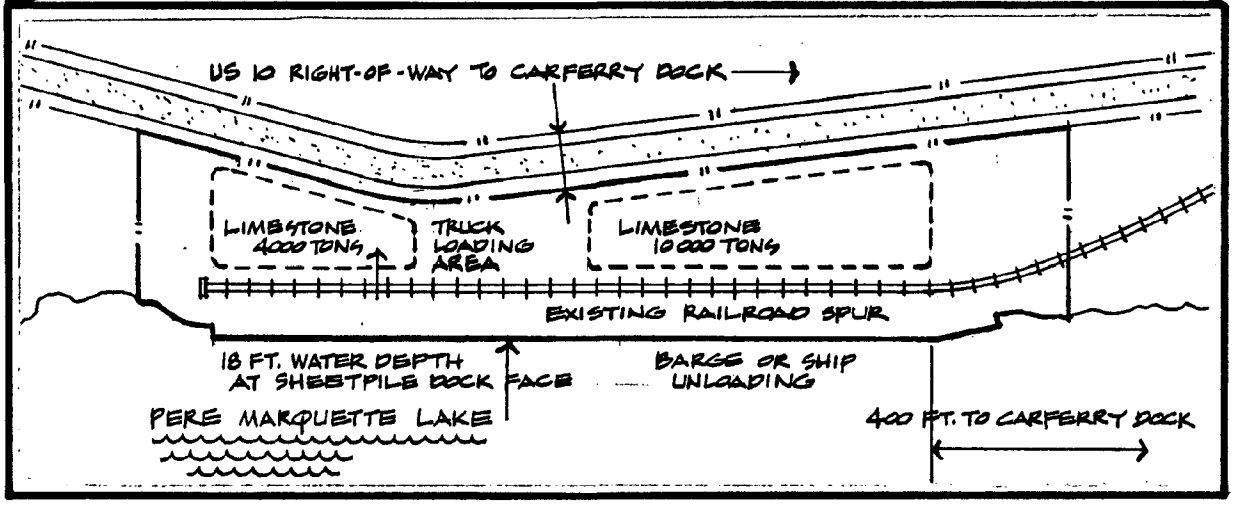
Annual Estimated Operating Costs ..... $9,370.

Operating costs per ton for 12,000 tons annually $0.78





Ludington's northcentral location makes midwest markets easily assessible by truck.



TYPICAL SITE LAYOUT

PROSPECTUS OBJECTIVES:

This prospectus provides background information on the Ludington, Michigan area, Pere Marquette Lake and harbor facilities, and the proposed dry bulk materials terminal. This information is intended as a resource for investors seeking a profitable marine terminal site in Michigan's western Lower Pennisula.

GENERAL BACKGROUND:

The community of Ludington, with a 1980 population of 8937, is the commercial center of Mason County. Manufacturing currently provides over 60 percent of the area's employment. Located on the eastern shores of Lake Michigan, Ludington is also a major recreational hub of the region. Sport fishing, swimming, boating, hiking, snow skiing, and snowmobiling are among the popular outdoor activities that provide year-round enjoyment for both residents and tourists.

New home construction costs in the Ludington area generally start at $60,000, while older homes are also available in favorable locations to fit various lifestyles. The West Shore Community College offers residents many special interest courses, training programs, workshops and lectures.

HARBOR FACILITIES:

Ludingtion has a natural deep water year-round harbor which serves a variety of commercial and recreational needs. Presently, approximately two million short tons annually are shipped through the harbor. The recently completed $5 million channel improvement project, under the guidance of the Army Corps of Engineers, has improved navigation in the port.

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PROJECT DATA

LAND USE INFORMATION

Site Area ..... **13.8 Acres**

Land Use	Type	Area	Percent
	Public Streets	1.0 acres	7 %
	Open Storage and Facilities	3.8 acres	28 %
	Green Belt	2.3 acres	16 %
	Open Space	6.7 acres	49 %
		13.8 acres	100 %

ECONOMIC INFORMATION

Acquisition Cost ..... $300,000.

SITE IMPROVEMENT COSTS

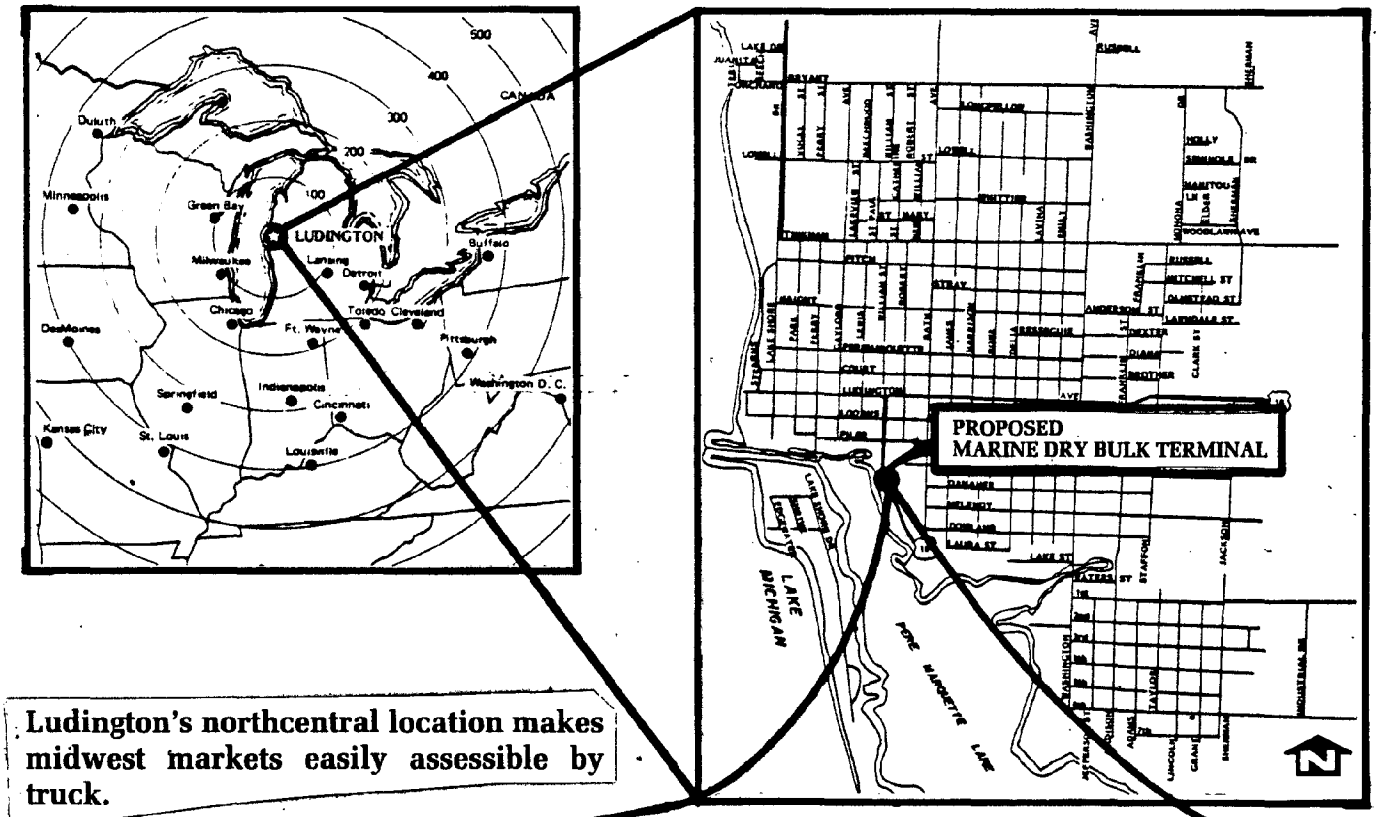
New Street ..... 70,000.
Sewer and Water ..... 14,000.
Dock Face Improvements ..... 60,000.

CONSTRUCTION COSTS

Office ..... $104,000.
Garage ..... 108,000.
Parking Lot and Driveways ..... 91,000.
Truck Scales ..... 31,000.
Landscaping ..... 50,000.
Stockpile Covering and Drainage ..... 50,000.
Total Site Improvement and Construction Costs ..... $578,000.

ANNUAL OPERATING COST ESTIMATE

Administration ..... 50,000.
Labor 40,000
Retirement of Site Improvement and Construciton Costs
(20 years at 13 %) ..... 82,000.
Property Rental Costs from C&O Railroad assessed at
$0.50/ton for an estimated 64,000 tons annually ..... 32,000.
Operating Expenses (equipment, utilities and supplies) ..... 15,000.
Annual Estimated Operating Costs ..... $219,000.
Operating costs per ton for 64,000 tons annually $3.42



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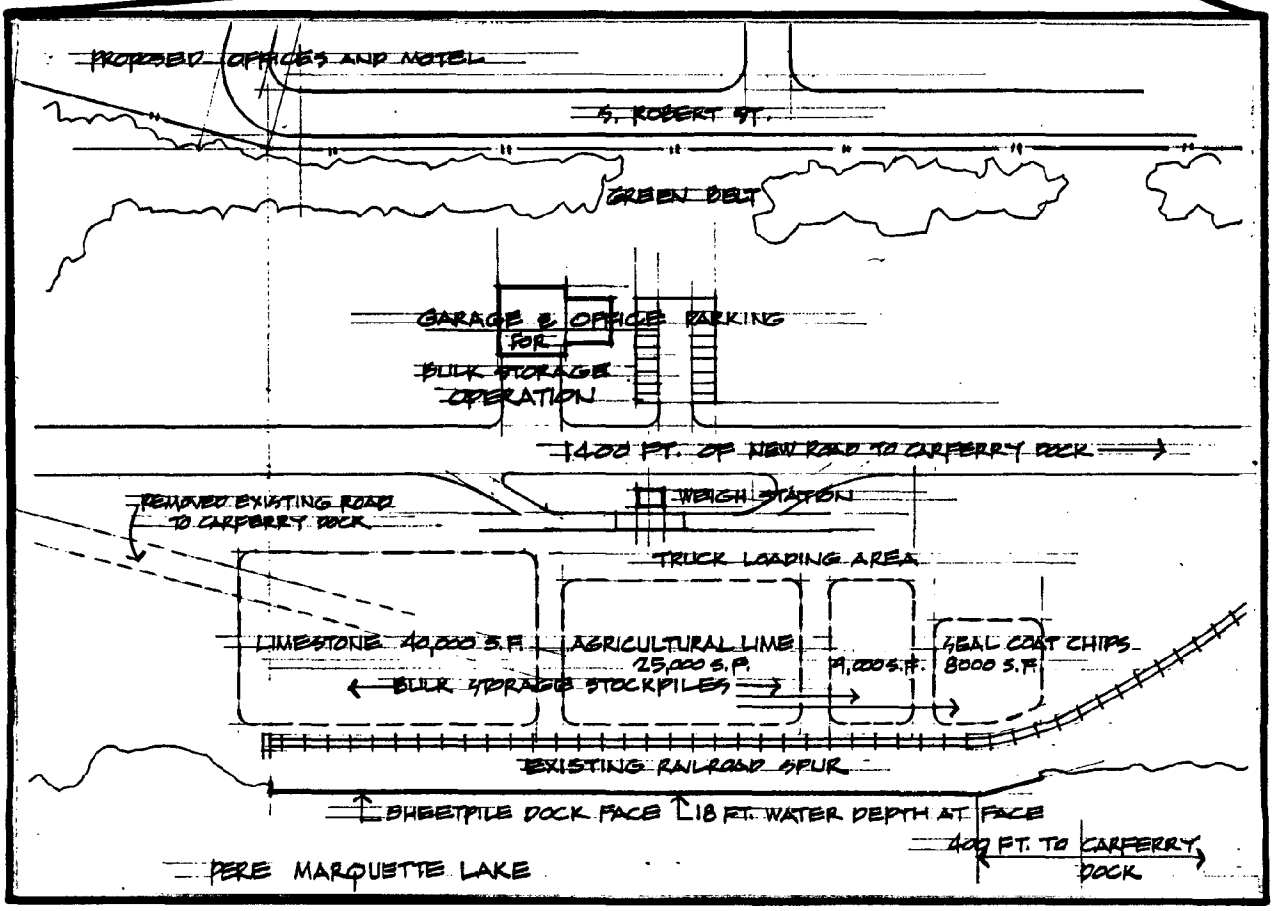

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COMMODITY DATA

Results of Bulk Shipping Terminal Contacts for Dry Bulk Terminal

Background Information

Sand is not a commodity which could feasibly be brought into a bulk terminal at Ludington, since it is a net exporter of sand. Most contacts indicated they owned or were very near by their sand and gravel source. Among the dry bulk commodities which might be feasibly brought into the port are:

1. Cement - Would not currently be feasible since the economy and construction volume are so depressed. However, cement is currently obtained from Muskegon by truck and might feasibly be shipped to Ludington if the demand increased (economy improved or a large construction project is begun).

2. Seal Coat Chips - Would be feasible to ship in since use is fairly constant by County Road Commissions, although it is down somewhat during slow economy.

3. Road Salt - Same as Seal Coat Chips.

4. Crushed Limestone - Is currently being brought into Ludington to two locations - Carey Docks and C&O slip 1-1/2 (Laman Asphalt).

5. Agricultural Lime - Used as a fertilizer but mainly supplied by sand and gravel truckers. Might feasibly be shipped into Ludington.

Results of Contacts: Total Number of Contacts = 15

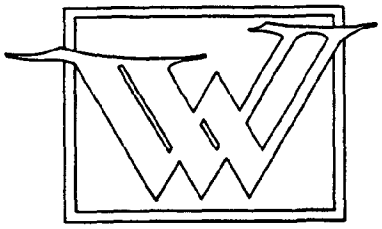
Summary

A dry bulk terminal should be feasible, particularly since the port is currently being used to bring in these items. Again, flexibility is important, as with fertilizers, to insure that, as shipping needs vary, the terminal will be able to receive a variety of commodities.

Appendix A

Ludington Commodity Flow Survey

ENGINEERS/PLANNERS/ARCHITECTS/SURVEYORS/GEOLOGISTS/CHEMISTS • 611 CASCADE W. PKWY., S.E., P.O. BOX 6510, GRAND RAPIDS, MI 49506 • PH: (616) 942-9600



WILLIAMS & WORKS

T.O. WILLIAMS, 1861-1941 • F.D. WORKS, 1880-1931 • W.B. WILLIAMS, 1895-1974

March 8, 1982

Dear Sir:

The City of Ludington, in cooperation with Pere Marquette Township, Mason County, and the Michigan Coastal Management Program, is studying the feasibility of expanded port utilization. If port expansion is warranted, a general development and management plan will be developed. Williams & Works has been retained to assist in this project.

Enclosed is a commodity flow survey which we would appreciate your taking a few minutes to fill out. A realistic understanding of your plans and needs is fundamental to the success of this study and the improvement of the Port of Ludington.

Please return the completed survey, to my attention, by March 19, 1982. Thank you for your cooperation.

Yours truly,

WILLIAMS & WORKS

David Landmann

David W. Landmann
Project Manager

Copy: Phyllis Ambrose, City of Ludington
Gordon Anderson, MDNR Coastal Zone Unit

/sv

LUDINGTON COMMODITY FLOW SURVEY

INSTRUCTIONS:

Complete part I once for your company as a whole.

Complete part II for each different commodity (as distinguished by four-digit Standard Industrial Code) shipped or received.

Leave blank any question which does not apply to your situation.

Additional comments or questions are encouraged and may be directed to David Landmann, Williams & Works, Inc. -- 616/942-9600.

PART I

A. GENERAL INFORMATION

FIRM_____

ADDRESS_____

CONTACT PERSON_____ TITLE_____

PHONE NUMBER_____

Please describe the general nature of your firm's business_____

_____

Standard Industrial Code (SIC), if known_____

Do you wish the responses to this survey to remain anonymous? YES___ NO___

B. PORT SELECTION

Which port do you use? ( ) Ludington ( ) Other_____

Who decides on the transportation mode?

( ) Local Plant Manager ( ) Corporate Headquarters

( ) Shipping Agent ( ) Other_____

Who determines the shipping route or port of entry/exit?

( ) Local Plant Manager ( ) Corporate Headquarters

( ) Shipping Agent ( ) Other_____

In choosing a shipping route or port of entry/exit, what information sources do you use?

( ) Your Port Experience ( ) Personal Port Visit

( ) Trade Books or Directories ( ) Recommendation of Agent or Shippers

( ) Port Advertising or Promotional Materials ( ) Other_____

Why do you utilize the port(s) that you do? Please rank the considerations below in priority order (1-highest, 2, 3, etc.). Ignore those that are not important in your selection decision.

___ a) Facilities ___ b) Staff Services

___ c) Security ___ d) Consolidation Services

___ e) Port Free Time Policies ___ f) Lack of Port Congestion

___ g) Port Charges ___ h) Inland Freight Rates

___ i) Highway Linkages ___ j) Railroad Linkages

___ k) Pipeline Linkages ___ l) Total Combined Costs

___ m) Customs Service ___ n) Sailing Schedule

___ o) Shipping Lines ___ p) Port Reputation

___ q) Tradition ___ r) Tax Advantages

___ s) Last Port of Call ___ t) Proximity to Plant/Raw Mat'ls.

___ u) Other_____

C. LUDINGTON'S FACILITIES

What deficiencies exist at the Port of Ludington?

( ) Harbor Entrance
( ) Channel Depth
( ) General Terminal Facilities
( ) Administrative Organization
( ) Facilities State of Repair
( ) Security
( ) Rate Structure
( ) Channel Width/Configuration
( ) Turning Basin
( ) Specialized Terminal Facilities
( ) Land Side Expansion Area
( ) Inter-Modal Connections
( ) Port Reputation
( ) Other_____

How many days have you lost to weather?_____

What improvements could be made at the Port of Ludington which would benefit/ increase your usage?

_____

_____

_____

How much would these improvements increase your tonnage shipped?

_____

_____

PART II

A. IMPORTS/EXPORTS

Commodity (as imported)_____ SIC_____

Commodity (as exported)_____ SIC_____

If this commodity is only exported, proceed to Part IIC.

B. IMPORTS

Year	Tonnage	Origination
1979	_____	_____
1980	_____	_____
1981	_____	_____
1982 (projected)	_____	_____
1985 (projected)	_____	_____
1990 (projected)	_____	_____

What is the basis of these projections?_____

_____

_____

What changes in technology, regulations, shipping rates, or the like would cause these projections to:

Increase?_____

_____

_____

Decrease?_____

_____

_____

How confident are you in these projections? _____% confident.

Are these imports... (please check one)

( ) shipped through Michigan? ( ) distributed to Michigan's lower peninsula

( ) remanufactured locally (water side)? ( ) Other_____

Is this commodity... (please check one)

( ) a finished product? ( ) an intermediate product? ( ) a raw material?

How is (will be) this material received?

	% Currently	% Near Future
( ) bulk		
( ) neo-bulk		
( ) container		
( ) break bulk		

In what form is this commodity received?

( ) gaseous ( ) liquid ( ) solid

C. EXPORTS

Year	Tonnage	Destination
1979		
1980		
1981		
1982 (projected)		
1985 (projected)		
1990 (projected)		

What is the basis of these projections? _____

_____

_____

What changes in technology, regulations, shipping rates, or the like would cause these projections to:

Increase?_____

_____

_____

Decrease?_____

_____

_____

How confident are you in these projections? ____% confident.

Do these exports... (please check one)

( ) originate from outside Michigan? ( ) originate from Michigan's lower peninsula

( ) originate locally (water side)? ( ) other_____

Is this commodity... (please check one)

( ) a finished product? ( ) an intermediate product? ( ) a raw material?

How is (will be) this material shipped?

	% Currently	% Near Future
( ) bulk		
( ) neo-bulk		
( ) container		
( ) break bulk		

In what form is this commodity shipped?

( ) gaseous ( ) liquid ( ) solid

LUDINGTON COMMODITY FLOW SURVEY
TABULATION

PART I

What port do you use?

	NUMBER
Ludington	2
None	2
Other:	
Escanaba	1
U.S. Atlantic & Gulf Ports	1
Alpena	1
Grand Haven	1
Milwaukee	2
Montreal	1
Charlevoix-St. James	1

Who decides on the transportation mode?

	NUMBER
Local Plant Manager	1
Shipping Agent	
Corporation Headquarters	6
Other:	
Location of Buyer	1
Traffic Department; Headquarters, Pittsburgh	1
Michigan Department of Management & Budget	1
Customers	2
Sales	1
General Manager	1

Who determines shipping route or port or entry / exit ?

	NUMBER
Local Plant Manager	1
Shipping Agent	
Corporation Headquarters	6
Other:	
Location of Buyer	1
Traffic Department; Headquarters, Pittsburgh	1
Michigan Department of Management & Budget	1
Customers & Vessel Carrier	1
Sales	1

In choosing a shipping route or port of entry/exit, what information sources do you use?

	NUMBER
Your Port Experience	5
Trade Books/Directories	3
Port Advertising	1
Personal Port Visit	3
Recommendation of Agent/ Shippers	3
Other:	
Location of Buyer	1
Tarriffs	1
Vessel Carrier & Customer	1
Carriers	1
Rate Factors	1

Why do you utilize the ports that you do?

	1st	2nd	3rd	4th or Lower
a) Facilities	1	2	1	1
b) Staff Services			1	
c) Security			1	
d) Consolidation of Services	1		1	1
e) Port Free Time Policies			1	1
f) Lack of Congestion		1		2
g) Port Charges	1	1		
h) Inland Freight Rates	2	3	1	2
i) Highway Linkages	1	1	1	1
j) Railroad Linkages	2		1	2
k) Pipeline Linkages			1	
l) Total Combined Costs	8		2	
m) Customs Services			1	1
n) Sailing Schedules	1	1	1	1
o) Shipping Lines	2		2	2
p) Port Reputation		1		1
q) Tradition			2	
r) Tax Advantages			1	
s) Last Port of Call			1	
t) Proximity to Plant/ Materials	1	1	1	3
u) Other:				
Custom Docks	1			
Adequate Service		1		
Location	1			

What deficiencies exist at the Port of Ludington?

	NUMBER
Harbor Entrance	1
Channel Width/Configuration	1
Channel Depth	1
Turning Basin	
General Terminal Facilities	
Special Terminal Facilities	
Administrative Organization	
Land Size Expansion Area	
Facilities State of Repair	
Inter-Modal Connections	
Security	
Port Reputation	
Rate Structure	
Other:	
Demand	

How many days have you lost to weather?

NONE OR 1	2 - 3	4 - 5	6 OR MORE
	2		1

What improvements could be made at the Port of Ludington which would benefit/increase your usage?

Various comments made regarding the general economy and shipping rates.

How much would these improvements increase your tonnage shipped?

Various comments made regarding the general economy and shipping rates.

PART II

A. IMPORTS/EXPORTS

Commodity As Imported		NUMBER
Bulk Ice Control Salt	( )	1
Woodpulp, Newsprint	( )	1
Limestone	( )	1
Components	( )	1

Commodity As Exported		NUMBER
Iron Ore Pellets	( )	1
Dead Burned Magnesite	( )	1
Sand	( )	1
Buckwheat, Peas, Birdseed	( )	1
Appliances	( )	1
Frozen Fruit	( )	1

B. IMPORTS

TONNAGE	ORIGINS	
	U.S. MID WEST	CANADA/ MEXICO
Year: 1979		
0 - 10,000		1
+10,000 - 20,000		
+20,000 - 30,000		
+30,000 - 40,000		
+40,000 - 50,000		
+50,000 - 60,000		
+60,000 - 75,000		
+75,000 -		
Year: 1980		
0 - 10,000	1	
+10,000 - 20,000		
+20,000 - 30,000		
+30,000 - 40,000		
+40,000 - 50,000		
+50,000 - 60,000		
+60,000 - 75,000		
+75,000 -		
Year: 1981		
0 - 10,000	1	
+10,000 - 20,000		
+20,000 - 30,000		
+30,000 - 40,000		
+40,000 - 50,000		
+50,000 - 60,000		
+60,000 - 75,000		
+75,000 -		
Year: 1982		
0 - 10,000		
+10,000 - 20,000		
+20,000 - 30,000		
+30,000 - 40,000		
+40,000 - 50,000		
+50,000 - 60,000		1
+60,000 - 75,000		
+75,000 -		

TONNAGE	ORIGINS	
	U.S. MID WEST	CANADA/ MEXICO
Year: 1985		
0 - 10,000		
+10,000 - 20,000		
+20,000 - 30,000		
+30,000 - 40,000		
+40,000 - 50,000		1
+50,000 - 60,000		
+60,000 - 75,000		
+75,000 -		
Year: 1990		
0 - 10,000		
+10,000 - 20,000		
+20,000 - 30,000		
+30,000 - 40,000		
+40,000 - 50,000		
+50,000 - 60,000		
+60,000 - 75,000		
+75,000 -		

Are these imports . . .

	NUMBER
shipped through Michigan?	1
distributed to Michigan's lower Peninsula?	1
remanufactured at waterside?	1
utilized locally?	

Is this commodity . . .

	NUMBER
a finished product?	1
an intermediate product?	
a raw material?	2

How is/will be this material be received?

CURRENTLY

	0 - 25%	26 - 50%	51 - 75%	76 - 100%
Bulk				2
Neo-Bulk				
Container				
Break Bulk				

FUTURE

	0 - 25%	26 - 50%	51 - 75%	76 - 100%
Bulk				2
Neo-Bulk				
Container				
Break Bulk				

In what form is this commodity received?

	NUMBER
Gaseous	
Liquid	
Solid	3

C. EXPORTS

TONNAGE	DESTINATION		
	U.S. EAST	EUROPE/U.S.S.R.	S. AMERICA
Year: 1979			
0 - 10,000			
+10,000 - 20,000			
+20,000 - 30,000		1	
+30,000 - 40,000			
+40,000 - 50,000			
+50,000 - 60,000			
+60,000 - 75,000			
+75,000 -	1		
Year: 1980			
0 - 10,000		1	
+10,000 - 20,000			
+20,000 - 30,000			
+30,000 - 40,000			
+40,000 - 50,000		1	
+50,000 - 60,000			
+60,000 - 75,000			
+75,000 -	1		
Year: 1981			
0 - 10,000		1	
+10,000 - 20,000			
+20,000 - 30,000		1	1
+30,000 - 40,000			
+40,000 - 50,000			
+50,000 - 60,000			
+60,000 - 75,000			
+75,000 -	1		
Year: 1982			
0 - 10,000		1	
+10,000 - 20,000		1	1
+20,000 - 30,000			
+30,000 - 40,000			
+40,000 - 50,000			
+50,000 - 60,000			
+60,000 - 75,000			
+75,000 -	1		

TONNAGE	DESTINATION		
	U.S. EAST	EUROPE/U.S.S.R.	S. AMERICA
Year: 1985			
0 - 10,000			
+10,000 - 20,000			
+20,000 - 30,000		1	
+30,000 - 40,000			
+40,000 - 50,000			
+50,000 - 60,000			
+60,000 - 75,000			
+75,000 -			
Year: 1990			
0 - 10,000			
+10,000 - 20,000			
+20,000 - 30,000			
+30,000 - 40,000		1	1
+40,000 - 50,000			
+50,000 - 60,000			
+60,000 - 75,000			
+75,000 -			

What is the basis of these projections?

	NUMBER
Historic Use	1
Discussion With Shippers	1

What changes in technology, regulations, shipping rates, or the like would cause these projections to:

	NUMBER
INCREASE:	
In Paved Road Mileage	1
Rail-Water, Rail-Intermodal Rate Reductions	1
Steel Business Increase	1
Construction	1
More Competitive Rates	1
DECREASE:	
Regulation Prohibiting Sodium Chloride	1
Steel Business Decrease	1

How confident are you in these projections?

	NUMBER
100% - 90%	1
89% - 80%	2
79% - 70%	
69% - 60%	
59% - 50%	
49% or less	

What is the basis of these projections?

	NUMBER
Economic Forecasts, Test Competition	1
Estimates	1

What changes in technology, regulations, shipping rates, or the like would cause these projections to:

	NUMBER
INCREASE:	
New Source of Foundry Sand	1
Better Port Facilities	1
DECREASE:	

How confident are you in these projections?

	NUMBER
100% - 90%	
89% - 80%	
79% - 70%	1
69% - 60%	
59% - 50%	1
49% or less	

Are these exports . . .

	NUMBER
originated outside Michigan?	2
originated from Michigan's Upper Peninsula?	
originated locally (water side)?	3

	NUMBER
Other:	
lower Peninsula?	2
several states?	1

Is this commodity . . .

	NUMBER
a finished product?	1
an intermediate product?	2
a raw material?	3

How is/will be this material be received?

CURRENTLY

	0 - 25%	26 - 50%	51 - 75%	76 - 100%
Bulk		1		3
Neo-Bulk				
Container		1		2
Break Bulk	2			1

FUTURE

	0 - 25%	26 - 50%	51 - 75%	76 - 100%
Bulk				1
Neo-Bulk				
Container				
Break Bulk				

In what form is this commodity recieved?

	NUMBER
Gaseous	
Liquid	
Solid	5

335 -
A. Lindberg & Sons, Inc.
560 Mather Ave.
Ishpeming, MI 49849

276 - Albert Meeusen
A&C Carriers, Inc.
2909 E. Laketon Ave.
Muskegon, MI 49442

1 - Brian D. Gibbon
Abitibi Paper Co. Ltd
P.O. Box 2990
Thunder Bay, Ontario, Canada

2 - H.G.E. Portch
Abitibi Paper Co. Ltd
Toronto-Dominion Center
Toronto, Ontario, Canada

3 - J.E. Wilbee
Abitibi Paper Co. Ltd
408 University Avenue
Toronto, Ontario, Canada

4 - M.H. Brown
Agrico Chemical Co.
P.O. Box 750
Saginaw, MI 48606

5 - D.W. Newbauer
Agrico Chemical Co.
P.O. Box 522, Saginaw Term.
Carrollton, MI 48724

6 -
Air Express International Agency
29300 Goddard Road
Romulus, MI 48174

7 - Ralph J. Nero
Airco Alloys & Carbide
3801 Highland Avenue
Niagara Falls, NY 14305

8 - Benjamin Bigelow
Albumina Supply Co.
82 Beaver Street
New York, NY 10005

9 - Ronald W. Hawkins
Alcoa Company of America
Alcoa Building
Pittsburgh, PA 15219

10 - Warren Steckmert
Alcoa Steamship Co.
17 Battery Place
New York, NY 10004

11 - Kurt Konodi-Floch
Alltransport Inc.
300 South Wacker Drive
Chicago, IL 60606

12 - Eric F. Tiegerman
Alox Corporation
3943 Buffalo Avenue, Box 556
Niagara Falls, NY 14303

293 -
Alpena Aggregate, Inc.
7590 Weiss Road
Alpena, MI 49707

294 -
Alpena County Road Commission
1400 N. Bagley
Alpena, MI 49707

13 -
Altransco
4461 West Jefferson
Detroit, MI 48209

14 - Niels H. Christensen
Am-Can Transport Inc.
P.O. Box 412
Westmont, IL 60559

15 -
Amerford International Corp.
27130 Trolley Industrial
Taylor, MI 48180

295 -
American Aggregates Corporation
Drawer 160
Greenville, OH 45331

16 - John P. Martell
American Can Company
American Lane
Greenwich, CT 06830

17 - Ed Hora
American Can Company
P.O. Box 702
Neenah, WI 54956

18 -
American Marine Supply
15 Ferris Street
Highland Park, MI 48203

260 -
American Mexican Petroleum Corp.
123 N. Northwest Highway
Park Ridge, IL 60068

19 - Leonard C. Kropp
American Motors Cop.
14250 Plymouth Road
Detroit, MI 48232

20 -
American President Line
24800 Northwestern SU400B
Southfield, MI 48075

21 - Louis E. Ervin
American Steamship Co.
Marine Tower
Buffalo, NY 24203

22 - Alex Greten
Amerlux Steel Products Co.
100 Park Avenue
New York, NY 10017

23 -
Amerny Shipping Agency
1 World Trade Center, #2743
New York, NY 10048

261 - L. F. Schnake
Amoco Oil Co./Fertilizer District
200 East Randolph Dr., MC 3303
Chicago, IL 60680

24 - John J. McDonough
Anaconda Company
25 Broadway
New York, NY 10004

25 -
Anchor Line/Chester, Blackburn
1 Word Trade Center, #1067
New York, NY 10048

26 -
Anderson Steamship Agency
23400 Michigan Avenue
Dearborn, MI 48214

35 -
Anglo Dutch Shipping/World Shipping
13530 Michigan; Room 210
Dearborn, MI 48136

27 - Norman D. Hilger
Ansul Company
One Stanton Street
Marinette, WI 54143

28 -
Anticost Shipping Co.
800 Dorchester Blvd.
Montreal, Quebec, Canada

29 -
Arctic Line/Int'l Great Lakes Ship'g
4461 West Jefferson
Detroit, MI 48209

333 -
Arenac County Road Commission
116 Bridge Street
Omer, MI 48749

31 -
Argentine Line/Shipping Ltd
410 St. Nicholas Street
Montreal, Quebec, Canda

32 -
Armada Line/Tolmar Int'l
20600 Eureka Road
Taylor, MI 48180

30 -
Artic Steamship Line/March Ship'g Ltd
400 Craig Street West
Montreal, Quebec, Canada

33 - William T. Pierce
Associated Cont. Transport
90 West Street
New York, NY 10006

34 -
Associated Container Transport
410 St. Nicholas Street
Montreal, Quebec, Canada

36 -
Atlantic Coast Agencies
17 Battery Place North
New York, NY 10004

37 -
Atlantic Container Line
80 Pine Street
New York, NY 10005

38 -
Atlantic Container Line
465 St. Johns Street
Montreal, Quebec, Canada

39 -
Atlantic Line & Nav/Azure Agencies
PO Box 127
Detroit, MI 48218

262 - C. P. Oonk
Atlantic Richfield Co./Michigan-West
1134 Post Ave.
Holland, Michigan 49423

40 -
Atlantica Line/Shipping Limited
410 St. Nicholas Street
Montreal, Quebec, Canada

41 -
Atlanttrafik Express/March Ship'g Ltd
400 Craig Street West
Montreal, Quebec, Canada

42 -
Azure Agencies, Inc.
P.O. Box 127
Detroit, MI 48218

296 -
B&K Sand & Gravel
Route #1
Wallace, MI 49893

43 -
B&K Shipping Agency
465 St. Johns Street
Montreal, Quebec, Canada

44 -
Baltic Steamship/March Shipping Ltd
400 Craig Street West
Montreal, Quebec, Canada

45 - Harry K. Barr
Barr Shipping Company
44 Beaver Street
New York, NY 10004

46 - Edward Ladd
Beaver Island Boat Co.
Charlevoix, MI 49720

299 -
Bedrock Aggregates
4225 W. Columbia Road
Mason, MI 48842

300 -
Beeman Trucking & Bulldozing Co.
Route #1
Grawn, MI 49637

47 - Freuland
Belgian Line Inc.
5 World Trade Center
New York, NY 10048

48 - Shadi L. Katyal
Bemis Company Inc.
800 Northstar Center
Minneapolis, MN 55402

49 - Michael B. Tillander
Bendix Corporation
Bendix Center
Southfield, MI 48076

50 - Richard S. Bennett
Bennett, R.S. & Co.
6869 W. Grand River Avenue
Lansing, MI 48901

301 -
Bichler Gravel & Concrete Co.
Box 263
Escanaba, MI 49829

51 - Louis F. Gallina
Black & Geddes, Inc.
11 Broadway
New York, NY 10004

52 -
Black Sea Canada/March Ship'g Ltd
400 Craig Street West
Montreal, Quebec, Canada

53 - Ms. Margaret Buchmann
Blue Line Coal Co.
975 Hansen Road
Green Bay, WI 54304

54 - Reford
Blue Star Line/Robt Reford Co, Inc.
221 St. Sacrement Street
Montral, Quebec, Canada

302 -
Blumke Excavating Co., Inc.
Box 126A
Alanson, MI 49706

55 - James A. Lehnen
BMV Manufacturing Co. Ltd
Whalley St; PO Box 130
Milverton, Ontario, Canada

56 - James J. Wagner
Boland & Cornelius
Marine Trust Bldg
Buffalo, NY 14203

263 - Leo V. Dalton
Boron Oil Company
1872 Guild Hall Building
Cleveland, Ohio 44115

57 -
Braemar Shipping Ltd
1 Westmount Square
Montreal, Quebec, Canada

58 - Don Brent
Brent Manufacturing, W.D., Ltd
Elmbank Road
Malton, Ontario, Canada

59 - Emlen G. Hare
Breton Agencies Ltd
PO Box 2290
Halifax, Nova Scocia, Canada

304 -
Brewers City Dock, Inc.
24 Pine Avenue
Holland, MI 49423

60 -
British Steel Corp./Kerr Steamship
1420 Parklane Towers East
Dearborn, MI 48126

307 -
Brownell Sand & Gravel Co.
14020 Morley Road
Manitou Beach, MI 49253

61 - F.D. Fountain
Budd Company
Corporate Office
Troy, MI 48084

62 - Joseph S. Baranoski
Budde & Westermann
350 Broadway
New York, NY 10013

340 -
Budzen Cement Products, Inc.
Route #1
Paw Paw, MI 49079

63 - Ron Bublick
Bultema Marine Transportation
559 E. Western Ave, Box 728
Muskegon, MI 49443

65 -
Canada Orient Line
637 Craig Street West
Montreal, Quebec, Canada

66 -
Canada Pacific Steamship
Place DU Canada
Montreal, Quebec, Canada

67 - F.A. Bennett
Canada Steamship Line
7 Port Street East
Port Credit, Ontario, Canada

68 -
Canada Steamship Line
759 Victoria Square
Montreal, Quebec, Canada

69 -
Canfreight Containers
300 St. Sacrement Street
Montreal, Quebec, Canada

70 - B.R. Carney
Carborundum Int Sales
PO Box 337
Niagara Falls, NY 14302

71 - Bruce Weinardt
Cargill
Maumee, OH

72 -
Carson M. Simon & Co.
209-211 Chestnut St.
Philadelphia, PA 19106

308 -
Cash & Carry Gravel Co.
P. O. Box 1105A
Holland, MI 49423

309 -
Caspian Construction Co.
100 W. Caspian
Caspian, MI 49115

73 -
Cast North America Ltd
East Tower, #521
Rolling Meadows, IL 60008

74 -
Cast North America Ltd
PO Box 1954 A
Detroit, MI 48232

75 -
Cast Ship Services/Hasserodt Marine
28430 Swan Island Dr.
Grosse Ile, MI 48138

64 - Jim Mueller
CCI Forest Product
Iron Mountain, MI 49801

76 - David LeBoeuf
Cedar River Lumber Co
PO Box 151
Powers, MI 49874

77 - William Kreckman
Champion International
2250 Wabash Avenue
St. Paul, MN 55114

310 -
Champion, Inc.
105 E. "A" Street, P. O. Box 490
Iron Mountain, MI 49801

311 -
Cheboygan Cement Products, Inc.
702 Lafayette Avenue
Cheboygan, MI 49721

78 -
Cherry Central Co-op
415 Munson Avenue
Traverse City, MI 48684

79 -
Christensen Canada Afr Line
465 St. Johns St.
Montreal, Quebec, Canada

80 - Donn B. Whitmer
Chrysler Corporation
PO Box 1976
Detroit, MI 48288

264 - Charles L. Dunlap
Clark Oil & Refining Corp.
8530 W. National Ave.
Milwaukee, Wisconsin 53227

81 - D.J. McKay
Clarke Transport Canada
1155 Dorchester Blvd West
Montreal, Quebec, Canada

82 - Don Ryan
Cleveland Cliffs Iron
Empire Mine
Ishpeming, MI

290 -
Cleveland-Cliffs Iron Co.
504 Spruce St.
Ishpeming, MI 49849

312 -
Click Sand & Gravel
P. O. Box 273
Port Huron, MI 48079

278 -
Coastal Tank Lines, Inc.
215 E. Waterloo Road
Akron, OH 44319

313 -
Coit Avenue Gravel Company, Inc.
4772 Coit Avenue, N.E.
Grand Rapids, MI 49505

314 -
Concrete Services, Inc.
W. Front Street
Traverse City, MI 49684

84 -
Constallation Navigation
233 Broadway
New York, NY 10007

83 - Nelson VanLeeuwen
Construction Aggregates Corp.
PO Box 342
Grand Haven, MI 49417

315 -
Construction Aggregates Corp.
P. O. Box 68
Ferrsburg, MI 49409

316 -
Contractors Gravel Co.
Box 83
Sparta, MI 49345

85 - James V. Guthrie
Cottman Company
300 Water Street
Baltimore, MD 21203

86 -
Coughlin, F.X. Co.
28451 Wick Road
Romulus, MI 48174

87 -
Cymeon Shipping Co.
25 Broadway, #514
New York, NY 10004

282 - D. M. Mitchell
D. M. Mitchell Transport Co.
3501 Wyoming Avenue
Dearborn, MI 48120

88 - Don Kirt
D&B Furniture Outlet
1300 38th Avenue
Menominee, MI

89 -
Dafra Line/Stevenson-Kerr Corp
29 Broadway
New York, NY 10006

90 - Joseph Grabowski
Del-Mar Inc.
1681 Columbus Road
Cleveland, OH 44113

91 -
Delta Steamship Lines
1 World Trade Center
New York, NY 10048

92 - H. George Miller
Diamond Crystal Salt
St. Clair, MI 48079

93 - T.J. Cloghesy
Domtar Newsprint Sale
940 Sun Life Building
Montreal, Quebec, Canada

305 -
Don Britton, Inc.
1480 Westwood Road
Marquette, MI 49855

95 - J.P. Dubreuil
Dubreuil Borthers Ltd
Dubreuilville, Ontario Canada

94 - Marshall Bonier
Dubreuil Brothers Ltd
530 Cathguard Street
Sault Ste. Marie, Ontario

318 -
Dunbar Sand & Gravel
P. O. Box 246
Cadillac, MI 49601

96 - William A. Dempsey
Dundee Cement Co.
Dundee, MI 48131

317 -
Earl Dubey & Sons
Route #3
Alpena, MI 49707

97 - William Austin
East Jordan Iron Works
East Jordan, MI 49727

98 - Joseph P. O'Donnell
Eastman Kodak Company
Lake Avenue
Rochester, NY 14650

99 - James E. Bowles
Emerson Electric Co.
1821 13th Street
Menominee, MI 49858

100 - Werner E. Scholtz
Ernst Russ-North America
One North LaSalle St
Chicago, IL 60602

101 -
Eurolakes Tanker Line/Hasserodt Mar
28430 Swan Island Drive
Grosse Ile, MI 48138

102 -
Eurolakes Tanker Line/Hurum Ship'g
300 St. Sacrement Street
Montreal, Quebec, Canada

103 -
Express Forwarding Co.
28420 Highland Road
Romulus, MI 48174

104 - Ms. Melinda Otto
Exxon Minerals Co.
300 South Lake Avenue
Crandon, WI

105 - Robert Russell
Exxon Minerals Co.
655 Washington; PO Box 813
Rhinelander, WI 54501

106 -
Federal Comm/Navig Ltd
Stock Exchnge Twr/Victoria Sq
Montreal, Quebec, Canada

107 - James E. Roberts
Federal Lime & Stone
Huron Lime Plant
Huron, OH 44839

108 -
Finnlines/Boise-Griffin SS Co
1 World Trade Center, 38th Flr
New York, NY 10048

319 -
Fischer Gravel Co.
2604 S. Snyder Road
Wellston, MI 49689

109 - Richard C. Hanel
Footner & Company Inc
33 Rector Street
New York, NY 10006

110 - Allen A. Moody
Ford Motor Company
The American Road
Dearborn, MI 48121

111 - Richard Haupt
Ford Motor Company
One Parklane Blvd, #E200
Dearborn, MI 48126

112 - Arnold L. Sabin
Foreston Coal Co. Inc
353 Fifth Ave
New York, NY 10016

320 -
Fox Valley Construction Co.
Box 1274, 103 W. College Ave.
Appleton, WI 54911

113 - Albert Gani
Francosteel Corp.
757 Third Ave
New York, NY 10017

114 - Richard J. Sherry
Freight Traffic Service
12878 Farmington Road
Livonia, MI 48150

115 -
French Paper Company
Box 729
Niles, MI 49120

116 -
Furness, Withy & Co., Inc.
5 World Trade Center, #7411
New York, NY 10048

117 -
Gdynia America Line
1 World Trade Center
New York, NY 10048

306 -
Gene Brow Construction Co.
P. O. Box 5
Seney, MI 49883

118 - A. Pearson
General Mills Inc.
9200 Wayzata Blvd
Minneapolis, MN 55440

119 - Earl R. Wiseman
General Motors Corp.
30007 VanDyke Avenue
Warren, MI 48090

120 - Frank J. Weckerle
General Motors Corp.
Chevrolet Division
Buffalo, NY 14240

121 - Donald J. Prause
Georgia Pacific Corp.
308 Huron Street
Grayling, MI 49738

122 - P.J. Sullivan
Gerber Products Co.
Fremont, MI 49412

123 - Maurice Pelletier
Go-Pell Engineering
1035 Boul. Ste-Anne
Beauport, Quebec, Canada

124 - C.T. Lee
Goodyear Tire & Rubber
4315 Airwest, S.E.
Kentwood, MI 49508

125 - D.F. Brain
Goodyear Tire & Rubber
1144 East Market Street
Akron, OH 44305

127 -
Grace Line/March Shipping Ltd
400 Craig Street West
Montreal, Quebec, Canada

128 -
Grand Colombiana/United Liners Agcy
465 St. Johns Street
Montreal, Quebec, Canada

129 - Dominick Chiappone
Great Lakes Carbon Co
Electrode Division
Niagara Falls, NY

130 - Mario Signorelli
Great Lakes Container
103 Erieside Avenue
Cleveland, OH 44114

131 - David A. Healy
Great Lakes Motor Shipping
PO Box 2886
Livonia, MI 48151

126 -
Great Lakes Transcaribbean/Tolmar
20600 Eureka Road
Taylor, MI 48180

135 - Robert W. Freske
Great Plains Associated Ltd
123 Marmont Street; Box 358
Niles, MI 49120

132 - Robert Vanderheyden
Green Bay Packaging
PO Box 1107
Green Bay, WI 54305

133 - R.G. Olson
Green Giant Company
Le Sueur, MN 56058

321 -
Gronlund Gravel Co.
Route #2, Box 28
Bear Lake, MI 49614

134 - Alan B. Williams
GSW Limited
Box 5273, Terminal A
London, Ontario, Canada

265 - W. J. Berghoff
Gulf Oil Company - U.S.
P. O. Box 29165
Columbus, Ohio 43229

136 - Sven Hubner
Guthrie-Hubner, Inc.
Board of Trade Bldg
Duluth, MN 55802

137 - Lawrence O'Connor
Hanna Mining Co.
100 Erieview Plaza
Cleveland, OH 44114

291 -
Hanna Mining Co./Groveland Mine
Star Route 1, Box 131
Iron Mountain, MI 49801

138 -
Hapag/Lloyd/Russ/Montral Shipping
360 St. James Street
Montreal, Quebec, Canada

139 - Joe Karas
Hardy Salt Company
1501 Main Street
Manistee, MI 49660

140 -
Hasserodt Marine Agency
28430 Swan Island Drive
Grosse Ile, MI 48138

141 -
Hellenic Line/World Shipping, Inc.
13530 Michigan; Room 210
Dearborn, MI 48136

297 -
Henry Balkema Sand & Gravel
7758 Kilowatt Dr.
Kalamazoo, MI 49001

142 - Larry Eckert
Hercules (Cent. Reg)
Oakbrook, IL

143 - Lee Allen
Hickman, Williams & Co
100 Rannaissance Plaza #1875
Detroit, MI

144 - Richard W. Lambrecht
Hickman, Williams & Co.
40 Port Avenue
Monroe, MI 48161

322 -
Hodgkiss & Douma, Inc.
P. O. Box 311
Petoskey, MI 49770

145 - William J. Cochran
Hooker Chemical Corp.
Chemicals & Plastics
Niagara Falls, NY 14302

146 -
Hurum Shipping/Trade Co.
300 St. Sacrement Street
Montreal, Quebec, Canada

147 -
I.M.C. Industries Group/Azure Agncy
PO Box 127
Detroit, MI 48218

266 - J. F. Swain
Industrial Fuel & Asphalt Corp.
566 Market Avenue, S.W.
Grand Rapids, MI 49502

148 - James P. Dwyer
Industrial Minerals of Canada
7 King Street East
Toronto, Ontarioa, Canada

149 - A.J., Jr. Cayia
Inland Lime & Stone Co.
Div. of Inland Steel Co.
Gulliver, MI 49840

334 -
Inland Lime and Stone Co.
Gulliver, MI 49840

292 -
Inland Steel Co./Sherwood Mine
P. O. Box 232
Iron River, MI 49935

151 -
International Great Lakes Shipping
111 East Wacker Drive
Chicago, IL 60601

152 - P. Norman Ness
International Milling Co., Inc.
Minneapolis, MN

150 - Paul B. St. Onge
International Mineral & Chemical Co.
Old Orchard Road
Skokie, IL 60076

153 - William J. O'Meara
International Multifoods
1300 Investors Bldg
Minneapolis, MN 55402

157 - Thomas P. Monahan
International Salt Co.
614 Superior Ave, #1414
Cleveland, OH 44113

154 - Frank J. McGinley
International Standard Electric Co.
50 Church Street
New York, NY 10007

156 - Harry J. Delay
International Talc Co., Inc.
90 West Street
New York, NY 10006

155 - Irving Lichter
Interntional Steel Products
233 Broadway
New York, NY 10007

158 -
Irish Shipping Ltd/Shipping Ltd
410 St. Nicholas Street
Montreal, Quebec, Canada

159 -
Japan Line Services
1 World Trade Center, #2867
New York, NY 10048

303 -
John Boerman Sand & Gravel
Route 4
Allegan, MI 49010

160 - Kurt H. Waldmann
Jones & Laughlin Steel Co.
15 Court Street
Buffalo, NY 14202

161 -
K Line
465 St. Johns Street
Montreal, Quebec, Canada

323 -
K&V Gravel Company
403 Cherokee Drive
Fremont, MI 49412

162 - James S., Jr. White
Kendall Refining Company
Bradford, PA 16701

163 -
Kerr Steamship Co., Inc.
1420 Parklane Towers East
Dearborn, MI 48126

164 - Jon D. Counts
Kimberly-Clark Corp.
Neenah, WI 54956

324 -
Koboski Coal Company, Inc.
114 Washington Street
Petoskey, MI 49770

267 - Don Price
Koch Fuels, Inc.
P. O. Box 128
Ferrysburg, MI 49409

268 - D. C. Horton
Koch Fuels, Inc.
P. O. Box 307
Green Bay, WI 54305

165 - Edward McKendry
Koppers Company, Inc.
PO Box 129
Peshtigo, WI 54157

166 -
Kuehne & Nagle, Inc.
6170 Middlebelt Road
Romulus, MI 48174

167 - Charles D. Parmelee
Lake Ontario Cement
King Street
Toronto, Ontario, Canada

325 -
Lake Sand and Gravel Co.
P. O. Box 829
Baldwin, MI 49304

168 - Robert Rotundo
Lake-Link Transportation Corp.
Ontonagon, MI 49953

269 - Edward Fleischman
Lakeside Refining Co.
Box 909
Kalamazoo, MI 49005

169 - Karl, P.E. Hauser
Levy, Edward C. Company
8800 Dix Avenue
Detroit, MI 48209

279 - Lewis C. Johnson
Liquid Transport, Inc.
2000 E. Superior Street
Alma, MI 48801

170 - Edward N. Locke
Locke, Edward N.
P.O. Box 488
Marquette, MI 49855

171 - Randy Anzalone
Louisiana-Pacific Corp.
Hayward, WI

172 - Leonard J. Russ
Luria Brothers & Co., Inc.
4446 Main Street
Buffalo, NY 14226

277 - Peter R. Gout
M. L. Ashbury, Inc.
1100 S. Oakwood
Detroit, MI 48217

173 -
Maersk Line/Robt Reford Co., Inc.
221 St. Sacrement Street
Montreal, Quebec, Canada

174 -
Manchester Liners/Mardell Shipping
333 West Fort; Suite 1806
Detroit, MI 48226

270 - W. R. Gravius
Marathon Oil Co./Wholesale Sales
26400 Lahser Road
Southfield, MI 48034

175 - Brian A.H. Cartwright
Maritime Coastal Cont.
634 Barrington Street Tower
Halifax, Nova Scotia, Canada

280 -
McKinley Trucking Co.
Carson City, MI 48811

176 - Gerald R. Gould
Mead Paper
Publishing Paper Division
Escanaba, MI 49829

177 -
Medlakes Service/Montreal Shipping
360 St. James Street
Montreal, Quebec, Canada

178 - Donald Estebo
Menominee Paper Co.
P.O. Box 300
Menominee, MI 49858

179 -
Mexican Line/Smith & Johnson
11 Broadway
New York, NY 10004

180 - Charles Duffrin
Michigan Handle & Block
PO Box 8
Wallace, MI 49893

281 -
Michigan Transportation Co.
3601 Wyoming Ave.
Dearborn, MI 48120

181 - James A. Calvey
Mid-Continent Coal
5031 Turney Road
Cleveland, OH 44125

182 - William L. Cook
Minneapolis Grain Exchange
400 South 4th Street, #652
Minneapolis, MN 55415

271 - E. W. Thompson
Mobil Oil Corp./Lansing Dist. Office
P. O. Box 1330
East Lansing, MI 48823

183 -
Montreal Shipping Ltd
360 St. James Street
Montreal, Quebec, Canada

184 - William E. Brandt
Morton Salt Company
110 North Wacker Drive
Chicago, IL 60606

185 - Alex C. Little
Murray & Robinson, Ltd
11 King Street West, #1400
Toronto, Ontario, Canada

186 -
Nahrgang, V.G., Co.
155 West Congress Street
Detroit, MI 48226

187 - Richard Harris
National Gypsum Co.
National City, MI

188 - Robert J. Eaton
National Gypsum Company
325 Delaware Avenue
Buffalo, NY 14202

189 -
Nebam Line/International Great Lakes
4461 West Jefferson
Detroit, MI 48209

190 - J. Leonard
Nestle Company, Inc.
100 Bloomingdale Rd.
White Plains, NY 10605

191 - Ms. Ava Sauer
Nettles & Company, Inc.
9801 West Higgins Road, #416
Rosemont, IL 60018

192 - Bernard S. Costello
New England Shipping Agency
177 State Street
Boston, MA 02109

193 - Stanely W. Gordon
New York International Sales
347 Fifth Avenue
New York, NY 10016

194 - Ray L. Falkner
Niagara of Wisconsin
Materials Manager
Niagara, WI 54151

195 -
Nordana Line/Barber Steamship Line
17 Battery Place
New York, NY 10004

298 -
Norman Bartlett Sand & Gravel
Route #3, Box 86
East Jordan, MI 49727

196 - Edward Fox
North Star Steel Co.
3000 East Front Street, B 1200
Monroe, MI 48161

284 -
Northwood Oil Co.
P. O. Box 408
Cheboygan, MI 49721

336 -
Onaway Stone Co., c/o Cherryland Cut Stone Co.
Route 4, Box 529
Traverse City, MI 49684

197 - Martin J. O'Doherty
Ontario Paper Company
Thorold, Ontario, Canada

198 - Richard A. Trampe
Pabst Brewing Company
917 West Juneau Avenue
Milwaukee, WI 53201

199 -
Pacific Star Line
1155 Dorchester Blvd West
Montreal, Quebec, Canada

200 - Seymour K. Padnos
Padnos Iron & Metal Co.
River Avenue at Bayside Drive
Holland, MI 49423

201 -
Panocean Bulk Carrier/Patton S'ship
26300 Northwestern Highway
Southfield, MI 48076

202 -
Parcel Tankers Inc./Hasserodt Marine
28430 Swan Island Drive
Grosse Ile, MI 48138

203 - Brian A. Galvin
Park Gate Iron/Steel
1 North LaSalle Street
Chicago, IL 60642

204 -
Patton Steamship Agency
26300 Northwestern Highway
Southfield, MI 48076

205 -
Peninsula Fruit Exchange
2955 Kroupa Road
Traverse City, MI 49684

272 - Charles G. O'Donnell
Pennzoil Co./Grand Rapids District
7893 Foxwood
Richland, MI 49084

206 - Edward E., Jr. Rodgers
Pennzoil Company
Executive Offices
Oil City, PA 16301

273 -
Phillips Petroleum Co.
909 Mayfair Road
Wauwatosa, WI 53226

208 - Howard Collier
Pillsbury Company
PO Box 128
Morral, OH 43337

216 - E.J. Bedor
Pillsbury Company
Agri-Products Division
Minneapolis, MN

209 - Richard K. Krawze
Pine River Lumber Co.
Long Lake, WI 54542

210 -
Polish Ocean Line/Int'l Grt Lakes Shp
4461 West Jefferson
Detroit, MI 48209

211 - Robert H. Allen
Presque Isle Corp.
Box 426 (Stoneport)
Alpena, MI 49707

337 -
Presque Isle Corp.
P. O. Box 426
Alpena, MI 49707

285 - Ms. Verna Priebe
Priebe Transport Co.
1207 Broad Street
St. Joseph, MI 49085

212 - Douglas Deitrich
Procter & Gamble
502 Eastman Avenue
Green Bay, WI 54301

213 - Robert M. Burke
Procter & Gamble Co.
Buying and Traffic
Cincinnati, OH

214 -
Protos Shipping Ltd
407 McGill Street
Montreal, Quebec, Canada

215 -
Quaker State Oil Refinery
Export Manager
Oil City, PA 16301

283 -
Ray Molder, Inc.
8300 Beech-Daly Road
Taylor, MI 48180

286 -
Refiners Transport and Terminal Corp.
445 Earlwood Ave.
Oregon, OH 43616

287 -
Rex Transportation Co.
1520 N. Woodward Ave., Suite 207
Bloomfield Hills, MI 48013

217 - E.J. Sullivan
Robin Hood Flour Mills
Montreal, Quebec, Canada

218 - Donald G. Castonguay
Rothesay Paper Corp.
Traffic Manager
St.John,New Brunswick,Canada

219 - Richard S. Baibak
Saginaw Bay Trading Co.
245 South Main Street
Frankenmuth, MI 48734

220 - C. Sabinsky
Saguenay Shipping Ltd
1060 University Street
Montreal, Quebec, Canada

221 - Richard Sarenac
Sarenac Shipping Co.
647 West Virginia Street
Milwaukee, WI 53204

326 -
Schworm, Inc.
P. O. Box 162, M-37 South
Traverse City, MI 49684

327 -
See's Sand & Gravel, Inc.
4500-31 Mile Road
Romeo, MI 48065

222 - Art Kitzens
Serv-Best Foods
Highland Park, IL

274 - R. W. Sherwood
Shell Oil Company/Milwaukee Dist.
3505 North 124th St.
Brookfield, WI 53005

223 - Wm. J. McLaughlin
Shipping Limited
410 St. Nicholas Street
Montreal, Quebec, Canada

328 -
Shook Paving Company
8281 Snows Lake Road
Greenville, MI 48838

224 -
Showa Line/Clark Transport Canada
1155 Dorchester Blvd, West
Montreal, Quebec, Canada

225 -
Sidemar Navigation/World Shipping
13530 Michigan; Room 210
Dearborn, MI 48136

329 -
Sievert Brothers, Inc.
200 E. River Street
Manistee, MI 49660

226 - William G. Benisch
Spencer Kellogg Division
120 Delaware Avenue
Buffalo, NY 14240

227 - Richard D. Anderson
Standard Alliance Ind.
1211 West 22nd Street, 1008
Oak Brook, IL 60521

228 - William Gagner
Standard Milling Co.
Standard Elevator & Grain
Buffalo, NY

229 -
Stanek & Sons, Inc.
9378 Co. Road 633; PO Box 253
Traverse City, MI 49684

288 -
Stang Tank Lines
P. O. Box 257
Menominee, MI 49858

230 - Stanley J. Stewart
Steelmet, Inc.
1204 Grant Building
Pittsburgh, PA 15219

231 - Patrick J. Fox
Stroh Brewery Co.
909 East Elizabeth Street
Detroit, MI 48226

232 -
Surinam Line/Hansen & Tidemann
1 World Trade Center, #1627
New York, NY 10048

233 - Rheinberger
Swift & Company
Chicago, IL

275 - S. Tolbert
Texaco, Inc.
630 E. "B" Street
Iron Mountain, MI 49801

234 -
Texas Transport & Terminal
71 Broadway
New York, NY 10006

235 - Sam T. Boleware
The Ohio River Company
1045 Evans Road
Flossmoor, IL 60422

236 - Hugh R. Murchie
Total Petroleum, Inc.
13544 West Bayshore Drive
Traverse City, MI 49684

338 -
U. S. Steel Corporation
Limestone Operations
Rogers City, MI 49779

237 - Harry Ainsworth
U.S. Gypsum
Alabaster, MI

244 - Fred A. Hopfinger
U.S. Plywood Corporation
1160 Scottsville Road
Rochester, NY 14624

245 - Arnold E. Busse
U.S. Steel Corporation
1000 E. 80th Place, #617
Merrillville, IN 46410

246 - N.V. McLean
U.S. Steel Corporation
3001 West Big Beaver Road
Troy, MI 48084

247 - Duane G. Rohrer
U.S. Steel Corporation
Cedarville Plant
Cedarville, MI 49719

248 - W.R. Ransom
U.S. Steel Corporation
400 Missabe Building
Duluth, MN 55802

249 - D.T. VanZandt
U.S. Steel Corporation
600 Grant Street
Pittsburgh, PA 15230

238 - Vincent G. Wilson
Union Carbide Corp.
270 Park Avenue
New York, NY 10017

239 - Phil Iverson
United Block Company
Arcade, NY 14009

240 - Keith Eccles
United Sierra
80 Coehill Drive, Apt. 105
Toronto, Ontario, Canada

241 - Ms. Wendy Lenfield
Upjohn Company
Kalamazoo, MI

242 - Robert D. Fischl
Upper Peninsula Shipbldg
Foot of River Street
Ontonagon, MI 49953

243 -
Uruguayan Line/B&K Shipping Agency
465 St. Johns Street
Montreal, Quebec, Canada

339 -
Van Deusen Stone Co.
234 S. Huron Road
Au Gres, MI 48703

289 -
Wagoner Transportation Co.
755 E. Hackley Ave.
Muskegon Heights, MI 49444

250 - Wayne, C. Johnson
Walter C. Best, Inc.
Chardon, OH 44024

251 - Zenon Baranski
Ward Hydronics, Inc.
11600 Genesee Street
Alden, NY 14004

252 - R.D. Waterman
Waterman Fruit Producers
North Road
Ontario Center, NY 14520

253 - Frank Barry
Welch Grape Juice Co.
General Traffic Manager
Westfield, NY 14787

330 -
Wexford Gravel Co.
300 Haynes St.
Cadillac, MI 49601

254 - Bruce Karnes
Whirlpool Corporation
Benton Harbor, MI 49022

255 - R.G. Dodge
Wickes Corp, Michigan Bean
1741 North Niagara, PO Box 2069
Saginaw, MI 48605

331 -
Wiggins & Sons
Merritt, MI 49667

256 - Joseph H. Carollo
Windsor Detroit Bridge Line
4461 West Jefferson Street
Detroit, MI 48209

257 - Huberto Platz
Wisconsin Electric
Milwaukee, WI

332 -
Wolverine Gravel Co.
3790 Puite, S.W.
Grandville, MI 49418

258 - Howard A. Lambka
World Shipping Inc.
13530 Michigan Ave., #210
Dearborn, MI 48126

259 -
Y.S. Line/Texas Transport & Ter.
71 Broadway
New York, NY 10006

Appendix B
Feasibility Data & Calculations

APPENDIX B

FEASIBILITY DETERMINATION CALCULATIONS, DATA, AND SOURCES

SECTION I. LOCAL PLANT DEVELOPMENT CALCULATIONS AND DATA

A. Hydraulic Cement Production

Production volume is 4,000,000 barrels/year or 750,000 tons/year (one barrel = 376 lbs)

TABLE B-1
Breakdown of Operating Costs for a
Typical 4,000,000 barrel/year Cement Plant

Item	Symbol	Plant Cost Per Barrel
Labor	L	$0.76
Fuel	F	0.68
Power (electrical)	P	0.59
Miscellaneous Supplies	S	0.57
Maintenance & Materials	M	0.34
Supervision & Overhead	O	0.28
Depreciation Expense	D	0.71
TOTAL		$3.93

TABLE B-2
Locality Cost Adjustment Factors

City	Labor (A_l) Adjustment	Electrical (A_p) Adjustment	Materials (A_m) Adjustment	Depreciation (A_d) Adjustment
Chicago	1.01	1.21	0.94	0.97
Grand Rapids	0.99	1.25	0.96	0.97
Lansing	0.93	0.88	0.90	0.91
Ludington	0.86	1.25	0.89	0.87
Milwaukee	1.03	0.87	1.02	1.02
Traverse City	0.79	1.25	0.88	0.83

Calculation of Manufacturing Costs (MFG):

$$MFG = (L \times A_l) + F + (P \times A_p) + S + (M \times A_m) + O + (D \times A_d)$$

Sample calculation for Chicago:

$$MFG = (0.76 \times 1.01) + 0.68 + (0.59 \times 1.21) + 0.57 + (0.34 \times 0.92) + 0.28 + (0.71 \times 0.97)$$

MFG = $4.02/barrel

TABLE B-3
Cement MFG Costs by Cities

	$/Barrel	$/CWT (100 lbs)
Chicago	4.02	1.07
Grand Rapids	4.04	1.07
Lansing	3.71	0.99
Ludington	3.84	1.02
Traverse City	3.76	1.00

Raw Material Requirements:

To produce one ton of cement requires approximately:

1.2 tons of limestone
0.4 tons of clay
0.027 tons of gypsum

Calculation of Costs to Transport Raw Materials (T raw):

$$T\ raw = \frac{(\$/ton\text{-}mile)}{20} \times (miles\ to\ limestone\ source) \times 1.2$$
$$+ \frac{(\$/ton\text{-}mile)}{20} \times (miles\ to\ clay\ source) \times 0.04$$
$$+ \frac{(\$/ton\text{-}mile)}{20} \times (miles\ to\ gypsum\ source) \times 0.027$$

T raw is expressed in terms of $/CWT of finished cement product.

Costs per ton-mile versus distance are developed from actual quotes and statistics for various commodities transported on various routes and distances. Table B-4 contains data used to compute T raw. T raw is computed using the least expensive transportation mode for each raw material.

Sample calculation for T raw for Chicago:

$$T\ raw = \frac{(.20)}{20} \times 60 \times 1.2 = 0.72$$
$$\frac{(.28)}{20} \times 10 \times 0.4 = 0.06$$
$$\frac{(.28)}{20} \times 10 \times 0.027 = 0.004$$
$$T\ raw \qquad 0.78\ for\ Chicago$$

TABLE B-5
T raw, $/CWT of Cement

Chicago	0.78
Grand Rapids	0.78
Lansing	0.58
Ludington	0.54
Traverse City	0.73

TABLE B-4

Transportation Distances and Costs
Per Ton/Mile for Raw Materials

	Limestone							Clay			Gypsum				
		By Truck		By Rail		Waterborne			By Truck			By Truck		By Rail	
	Source	Miles	$/Ton-Mile	Miles	$/Ton-Mile	Miles	$/Ton-Mile	Source	Miles	$/Ton-Mile	Source	Miles	$/Ton-Mile	Miles	%/Ton-Mile
Chicago	LaPorte, IN	60	.20	60	.20	-	-	Local	10	.28	Local	10	.28	-	-
Grand Rapids	Bellevue, MI	60	.20	60	.20	-	-	Local	10	.28	Local	10	.28	-	-
Lansing	Bellevue, MI	35	.24	-	-	-	-	Local	10	.28	Grand Rapids	65	.20	65	.20
Ludington	Charlevoix, MI	140	.11	140	.055	126	.08	Local	10	.28	Grand Rapids	95	.15	95	.15
Traverse City	Charlevoix, MI	50	.22	-	-	-	-	Local	10	.28	Grand Rapids	140	.11	140	.055

B. Pulp and Paper Production

Pulp Production

Production volume is 900 tons/day of bleached kraft pulp

TABLE B-6
Breakdown of Operating Costs for a
Typical 900 ton/day SBK Pulp Mill

Item	Symbol	Plant Cost Per Ton of Pulp
Raw Materials (pulpwood and chemicals)	M	$152
Energy	E	36
Labor	L	49
SG&A	S	10
Capital and Related	D	88
Profit	P	89
TOTAL		$424

Locality cost adjustment factors used are given in Table B-2, except power (energy) adjustment was not applied.

Calculation of Manufacturing Cost (MFG)

$$MFG = (M \times A_m) + E + (L \times A_l) + SG\&A + (D \times A_d) + P$$

Sample calculation for Chicago:

$$MFG = (152 \times 0.94) + 36 + (49 \times 1.01) + 10 + (88 \times 0.97) + 89$$
$$MFG = \$413/\text{ton of pulp}$$

TABLE B-7
Pulp MFG Costs by Cities

	$/ton Pulp	$/cwt Pulp
Chicago	$413	$20.65
Grand Rapids	$415	$20.75
Ludington	$389	$19.45
Milwaukee	$430	$21.50
Traverse City	$381	$19.00

Calculation of Costs to Transport Raw Materials (T raw):

To produce 1 ton of pulp requires approximately 2.5 tons of wood chips.

$$T\ raw = \frac{(\$/\text{ton-mile})}{20} \times (\text{miles to wood source}) \times 2.5$$

T raw is expressed in terms of $/cwt of pulp.

Costs for transporting wood from source in Escanaba, Michigan to the locations by various modes are given in Table B-8. T raw is computed using the least expensive transportation mode for each location.

TABLE B-8
T raw, $/cwt of Pulp

	$/cwt	Mode of Transportation
Chicago	1.54	Waterborne
Grand Rapids	3.24	Rail or truck
Ludington	1.22	Waterborne
Milwaukee	1.38	Waterborne
Traverse City	1.20	Waterborne

Calculation of Costs to Transport Finished Product (SBK Pulp) to Markets (T fin)

It is assumed pulp will be marketed to paper mills in major midwest cities in proximity to Lake Michigan in proportion to population. The breakdown of this market is as follows:

	1978 Population	Approximate % of Market
Chicago	7,030,000	70
Grand Rapids	585,000	5
Lansing	458,000	5
Milwaukee	1,417,000	15
Madison	319,000	5
TOTAL	9,809,000	100

Formula to compute T fin; (in terms of $/cwt of pulp)

$$\begin{aligned} T_{fin} = {} & (\text{distance to Chicago}) \times \left(\frac{\$/\text{ton-mile}}{20}\right) \times 0.70 \\ & + (\text{distance to Grand Rapids}) \times \left(\frac{\$/\text{ton-mile}}{20}\right) \times 0.05 \\ & + (\text{distance to Lansing}) \times \left(\frac{\$/\text{ton-mile}}{20}\right) \times 0.05 \\ & + (\text{distance to Milwaukee}) \times \left(\frac{\$/\text{ton-mile}}{20}\right) \times 0.15 \\ & + (\text{distance to Madison}) \times \left(\frac{\$/\text{ton-mile}}{20}\right) \times 0.05 \end{aligned}$$

T fin + Total

The data for calculation of T fin is contained in Table B-9.

TABLE B-9

TRANSPORTATION DISTANCES AND COSTS PER TON-MILE
FOR WOOD CHIPS FROM ESCANABA, MICHIGAN

PULP PRODUCTION AREA	BY TRUCK		BY RAIL		WATERBORNE	
	Miles	$/Ton-Mile	Miles	$/Ton-Mile	Miles	$/Ton-Mile
Chicago	315	0.082	320	0.07	274	0.045
Grand Rapids	370	0.070	370	0.07	-	-
Ludington	340	0.070	350	0.07	130	0.075
Milwaukee	225	0.105	230	0.07	200	0.055
Traverse City	250	0.080	270	0.07	120	0.080

TABLE B-10

TRANSPORTATION DISTANCES AND COSTS FOR
TRUCK TRANSPORTATION OF PULP TO MARKET AREAS

Plant Location	Chicago		Grand Rapids		Lansing		Milwaukee		Madison	
	Distance	$/Ton-Mile	Distance	$/Ton-Mile	Distance	$/Ton-Mile	Distance	$/Ton-Mile	Distance	$/Ton-Mile
Chicago	Local (20 mi.)	0.27	175	0.10	210	0.09	85	0.17	140	0.11
Grand Rapids	175	0.10	Local (20 mi.)	0.27	65	0.20	260	0.08	315	0.07
Ludington	235	0.08	95	0.15	160	0.10	320	0.07	375	0.07
Milwaukee	85	0.17	260	0.08	295	0.07	Local (20 mi.)	0.27	75	0.18
Traverse City	310	0.07	140	0.11	170	0.10	395	0.07	450	0.06

Sample calculation of T fin for Chicago:

$$\text{T fin} = \left(20 \times \frac{0.27}{20}\right) \times 0.7 = 0.19$$

$$+ \left(175 \times \frac{0.10}{20}\right) \times 0.05 = 0.04$$

$$+ \left(210 \times \frac{0.09}{20}\right) \times 0.05 = 0.05$$

$$+ \left(85 \times \frac{0.17}{20}\right) \times 0.15 = 0.11$$

$$+ \left(140 \times \frac{0.11}{20}\right) \times 0.05 = 0.04$$

$$\text{T fin} = 0.43$$

TABLE B-11
T fin, $/cwt Pulp

Chicago	0.43
Grand Rapids	0.87
Ludington	0.97
Milwaukee	0.65
Traverse City	1.12

C. Agricultural Chemical Production

Fertilizer plant (13-11-12 grade) with production volume of 400 tons/day or roughly 100,000 tons/year.

TABLE B-12
Breakdown of Operating Costs
(A Typical 400 ton/day Plant)

Item	Symbol	Plant Cost/ton
Raw Material	RM	$ 42.24
Utilities & Labor	UL	21.12
Depreciation	D	42.24
TOTAL		$105.60

TABLE B-13
Locality Cost Adjustment Factors

	Utilities & Labor Adjustment (A_{ul})	Depreciation Adjustment (A_d)
Chicago	1.17	0.97
Detroit	1.19	1.04
Grand Rapids	1.19	0.97
Lansing	0.89	0.91
Ludington	1.17	0.87
Madison	0.87	0.87
Milwaukee	0.90	1.02
Traverse City	1.16	0.83

Calculation of Manufacturing Costs (MFG)

$$MFG = RM + (UL \times A_{ul}) + (D \times A_d)$$

Sample calculation for Chicago

$$MFG = 42.24 + (21.12 \times 1.17) + (42.24 \times 0.97)$$

$$MFG = 107.92$$

TABLE B-14
MFG Costs by Cities

	$/ton	$/cwt
Chicago	107.92	5.40
Detroit	111.30	5.57
Grand Rapids	108.35	5.42
Ludington	103.70	5.18
Milwaukee	104.33	5.22
Traverse City	101.80	5.09

Calculation of Costs to Transport Finished Product (13-11-12 Grade) Fertilizer to Market (T fin)

It is assumed that the fertilizer will be marketed in Mason, Oceana, Manistee, Newaygo, Lake, Wexford, Missaukee, Osceola, Clare, and Mecosta Counties.

Big Rapids (Mecosta County) was selected as a representative wholesale market.

The calculation of (T fin) is given in Table B-15.

TABLE B-15
Transportation Distances and Costs for
Fertilizer to Big Rapids Market
By Railroad

Plant Location	Distance (miles)	Cost ($/ton-mile)	Total T fin ($/ton)
Chicago	230	.09	$20.70
Detroit	195	.11	21.45
Grand Rapids	55	.13	7.15
Ludington	60	.13	7.80
Milwaukee (via Kewaunee and Ludington)	250	.09	22.50
Traverse City	80	.13	10.40

SECTION II. REGIONAL SHIPPING TERMINAL DEVELOPMENT

Dry Bulk Terminal - Phase 1 Operation (for existing dry bulk commodity flows)
(Limited to inert aggregates only)

Limestone: Currently, the north end of the dock is being used by Laman Asphalt; continue to reserve this area for their use. Remainder of limestone to be placed at south end.

Typical Barge Characteristics (for self-unloaders):

Boom Length - varies from 50 to 200 feet (typical 150)
Capacities - vary from 1000 to 8000 tons (typical 2000)
Length - varies from 100 to 300 feet (typical 200)
Draft - varies from 8 to 20 feet (typical 12)

Booms on self-unloaders will not reach across US-10. This area could be used as "long-term" storage for materials moved across the road by loaders or reserved for future use.

Annual Quantities (from direct contacts):

Limestone -

Laman Asphalt - 2 barge loads x 2000 tons/barge = 4000 tons
Other - 8-10,000 tons

Stockpile Areas Required:

Limestone -

Laman Asphalt - Allocate area for storage of 1 barge load, or 2000 tons

Angle of repose for limestone is 35°

Tan 35° = 0.70, slope is about 1 on 1.5.

For a rectangular pile - width = 45 feet , height = 15 feet
Cross sectional area = 15 feet x 22.5 feet = 340 square feet

Pile length:

$$\frac{2000 \text{ ton} \times 23 \text{ cf/ton} \times 1.12 \text{ gross/net ton}}{340 \text{ sf}} = 150$$

Length = 150 feet; minimum area = 150 x 45 = approx. 7000 square feet

Other Limestone - Allocate the area at the south end of the dock. This area is approx. 17,000 square feet

For rectangular pile - width = 75 feet, height = 25 feet
Cross sectional area = 25 feet x 37.5 feet = 940 square feet
Pile length = 250 feet

Available storage area:

$$940 \text{ sf} \times 250 \text{ sf} = 235{,}000 \text{ cf}$$

$$\frac{235{,}000 \text{ cf}}{23 \text{ cf/ton}} = \text{approximately } 10{,}200 \text{ tons}$$

This area could stockpile the remainder of the total annual volume, or 4-5 barge loads.

Cost Estimate for Dry Bulk Terminal - Phase I Operation (inert aggregates only)

Minimal Dock Face Improvements:

Including the following -

Replacement of one (dislodged) mooring bollard	$ 1,000
Replacement of 25 feet of steel sheetpile cap (dislodged)	500
Minor upgrading of fender system (rubber tires)	500
TOTAL IMPROVEMENT COSTS	$ 2,000

Estimation of Operating Costs

All equipment and personnel to perform loading and unloading operations will be supplied by the terminal users. The only operating cost will be administrative (to perform record and bookkeeping tasks), and labor involved in minor maintenance of the rubber tire fender system.*

Operating Costs (annual)

Administrative	$2,000
O&M labor and materials	1,000
Debt retirement of improvement costs - 10 yrs @ 13%	370
Land lease costs - assessed on the basis of 50c/ton and assuming 10,000 tons/yr	5,000
TOTAL	$8,370

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* It is assumed existing staff will be able to assume these duties.

Dry Bulk Terminal - Phase 2 Operation

Materials with the most shipping potential (currently)

Crushed stone (mostly limestone)
Seal coat chips
Rock salt

Pit-run sand and gravel do not currently appear to be feasible commodities to ship into Ludington, as they are so abundantly available locally.

Sources of the Materials:

Limestone and seal coat chips are available from mines in the upper Lower Peninsula and Upper Peninsula. Rock salt is available in the Detroit area and is also shipped from the Gulf Coast. Thus, these materials are located such that water transportation is feasible, particularly in light of the fact that both seal coat chips and limestone are now brought into Ludington, and salt into Manistee occasionally.

Projected Annual Quantities:

Crushed Limestone: From phone conversations with County Road Commission employees, the annual use of limestone varies quite a bit, but a minimum amount of 25,000 cubic yards is typical. Several local contractors also reported a typical annual use of about 5,000 tons.

6 counties x 25,000 cy x 1.17 ton/cy	176,000 ton
10 local contractors x 5,000 tons	50,000 ton
TOTAL ESTIMATED ANNUAL CONSUMPTION	226,000 ton

Assuming that a terminal in Ludington would capture 50% of this requirement, the annual volume through the terminal would be approximately 100,000 tons.

Seal Coat Chips

Typical annual use of seal coat chips reported by County Road Commissions is 1,500 tons

6 counties x 1,500 tons = 9,000 tons

For a 50% market share, the annual volume would be 4,500 tons.

Rock Salt

Typical annual use of rock salt by County Road Commissions is 1,500 tons.

6 counties x 1,500 tons = 9,000 tons

For a 50% market share, the annual volume would be 4,500 tons.

Proposed Bulk Terminal Facilities:

The bulk terminal would provide open storage for half of the annual volume of commodities, or

50,000 tons limestone
2,500 tons seal coat chips
2,500 tons rock salt

Space Requirements:

Assuming a 1:2 slope for piled material (angle of repose) and pile height of 50 feet, cross-sectional pile area is:

$$\frac{50 \text{ ft} \times 2 \times 50 \text{ ft}}{2} = 2{,}500 \text{ sq.ft.}$$

Limestone:

$$\frac{50{,}000 \text{ tons} \times 23 \text{ cu.ft./ton}}{2{,}500 \text{ sq.ft.}} = 460 \text{ ft (length of pile)}$$

Salt and Seal Coat Chips:

$$\frac{2{,}500 \text{ tons} \times 30 \text{ cu.ft./ton} \times 2}{2{,}500 \text{ sq.ft.}} = 60 \text{ ft (length of both piles)}$$

Total Open Storage Area Required (doubled to allow for access, office building and garage):

$$(460 \text{ ft} + 60 \text{ ft}) \times 100 \text{ ft} \times 2 = 104{,}000 \text{ sq.ft.}$$

or approximately 2.5 acres

Equipment and Facilities Required:

Office - approximately 1,000 sq.ft.
Garage - approximately 2,500 sq.ft.
Truck Scales
Wheel Loader
Parking Lot - approximately 1800 sq.ft. or 200 sq.yd.

Cost Estimate
Dry Bulk Terminal

Site Improvement Costs		
New Street	1400 lf @ $50/lf	$ 70,000
Sewer - connect to existing on Foster St.	500 lf @ $20/lf	10,000
Water - relocate hydrants	200 lf @ $20/lf	4,000
Minor dock face improvements	600 lf @ $100/lf	60,000
Construction Costs		
Office	1600 sf @ $65/sf	$104,000
Garage	3600 sf @ $30/sf	108,000
Parking lot & misc. paving		
Lot and drive	6900 sf	
Drive to garage	3000 sf	
Truck loading area	6900 sf	
	16,800 sf @ $5/sf	84,000
Weigh station	350 sf @ $20/sf	7,000
Truck scales and remote reading system	Lump Sum	31,000
Stockpile covering and drainage	Lump Sum	50,000
Landscaping for Greenbelt	50,000 sf @ $1/sf	50,000
		$578,000

Calculation of the Annual Fee - Phase II Operation

Operating Expenses	
Salaries	$90,000
Utilities	10,000
Supplies and Equipment O&M	5,000
Property rental from C&O Railroad Assessed at $0.50/ton for an estimated 100,000 tons annually	50,000
Debt Retirement	
$578,000 @ municipal bond rate of 13.0% for 20 years	82,000
TOTAL	$237,000

Cost per ton (for 100,000 tons annually) = $2.37

Cost of Limestone Delivered to Ludington:

Cost of limestone (market price) in Ludington is approximately $18/ton

Transportation costs:

Barge from Alpena

250 miles x 4¢/ton-mile = $10.00/ton

Cost to truck to market (assume 35 miles average distance)

20 miles x 25¢/ton-mile = $5/ton

Fee ($/ton) that terminal could charge:

$18/ton	market price
-10	barge delivery cost, FOB (including material cost)
- 5	inland trucking
$ 3/ton	

Liquid Bulk Petroleum Terminal

Annual consumption of petroleum products in the six-county area is shown in the following tables.

	Annual Consumption by Fuel Type for 1980 (1000 gals)			
County	Motor Gasoline	Kerosine (#1 Fuel Oil)	#2 Fuel Oil	Diesel Fuel
Lake	2,203	119	171	-0-
Manistee	11,744	636	5,694	285
Mason	13,616	419	3,063	1,976
Oceana	7,394	248	1,273	850
Osceola	7,771	560	1,517	158
Wexford	12,029	1,085	2,290	128
TOTAL	54,757	3,067	14,008	3,397

Fuel Type	Total 1980 Consumption (1000 gal)	(barrels)	50% of total (barrels)	25% of total (barrels)	10% of total (barrels)
Motor Gasoline	54,757	1,303,700	651,900	325,900	130,400
Kerosine (#1 Fuel Oil)	3,067	73,000	36,500	18,300	7,300
#2 Fuel Oil	14,008	333,500	266,800	83,400	33,400
Diesel Fuel	3,397	80,900	40,400	20,200	8,100
TOTALS	75,229	1,791,100	895,600	447,800	179,200

1. Average gas service station size from our work for 4-Star Service Station.

   From service station data, average storage by fuel type:

Regular	35%
No Lead	25%
Premium	25%
Remainder	15% (fuel oil, range oil, and diesel fuel)

2. Average tank truck size: 10,000 gallons

3. Average railroad tank car size: 40,000 gallons

4. Average tank barge size:

From Greenwood's Guide -

Powered Tankers - # of ship tanks range from 4 to 27
net tonnage ranges from 12 to 10,000

Tank Barges - # of tanks range from 3 to 16
capacity ranges from 6,300 to 142,000 bbls

Average of "typical" size appears to be 20,000 bbl capacity with ten (10) tanks

Overall Length - approximately 230 feet
Draft - approximately 12 feet

Balance Sizes with Volumes:

Hinterland area yearly consumption of fuels is 1,791,100 barrels.

50% of market share = 895,600 bbls
25% of market share = 447,800 bbls
10% of market share = 179,200 bbls

Storage Requirements:

One of the controlling factors on sizing of terminal facility might be winter weather restrictions. For a two-month storage requirement:

25% Share
447,800 bbl/yr
74,600 bbl/2 mos

Storage requirements by type of fuel -

Gasoline	54,300 bbl
Kerosine	3,050 bbl
#2 Fuel Oil	13,900 bbl
Diesel Fuel	3,350 bbl

Tanks and sizes to meet above requirements -

Gasoline	
Regular	2 - 15,000 bbl
No-Lead & Premium	3 - 12,000 bbl
Kerosine	1 - 6,000 bbl
#2 Fuel Oil	1 - 12,000 bbl
Diesel Fuel	2 - 6,000 bbl

This allows for some rotating of storage capacity if necessary.

Assuming a 25% market share, the average month's requirements are 37,300 bbls.

For an average tank barge capacity of 20,000 bbl, this would require approx. 2 barge deliveries/month.

If 50% of product is trucked to destination and 50% by rail, then:

80 truck loads/month
3 truck loads/day

20 rail cars/month
1 rail car/day

If a typical gas station sells 600,000 gal/yr, or 50,000 gal/mo, the port could supply 30 gas stations.

Cost Structure:

for 15% Profit - $782,000/yr O&M and Debt Retirement
$117,300/yr Profit

Operating Fees		Fee Structure for 15% Profit	
Market Share	Gallons Per Year	$/Gallon	¢/Gallon
50%	37,529,000	0.0240	2.40
25%	18,764,500	0.0479	4.79
10%	7,505,800	0.1198	11.98

Operating Expenses	Cost/Year
Salaries: Administration	$ 50,000
Operators	60,000
Utilities and electric	25,000
Misc. supplies	5,000
Maintenance and equipment repair	15,000
Capital facilities: retirement	627,000
	$782,000

Construction Cost Estimate

Office (1200 sf @ $65/sf)		$ 78,000
Service Building (1600 sf @ $30/sf)		48,000
Parking and Loading Area (17,750 sf @ $5/sf)		89,000
Truck Loading Racks		40,000
Tanks and Appurtenances		
24,000 bbl - 2 @ $400,000		800,000
15,000 bbl - 4 @ $300,000		1,200,000
7,000 bbl - 3 @ $175,000		525,000
Concrete Tank Foundations (3,500 cy @ $250/cy)		875,000
Earthwork for Dikes (4,150 cy @ $10/cy)		42,000
Piping and Pumps		104,000
Fencing (2,600 lf @ $12/lf)		31,200
Gates (2 @ $3,500 each)		7,000
Foam Extinguishing System		40,000
	TOTAL	$4,407,000

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This document was prepared in part
through financial assistance provided by
the Coastal Zone Management Act of 1972
administered by the Office of Coastal Zone Management
National Oceanic and Atmospheric Administration